

Attorney Docket No. 43390-8001.US01

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By: James W. Bar

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/667,027	Confirmation No.	:	9124
Applicant	:	Thomson et al.	TC/A.U.	:	2681
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Declaration of Prior Invention Under 37 C.F.R. § 1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA

- I. This Declaration establishes invention prior to April 23, 2003.
- II. This Declaration is being made by Allan Thomson and Sudhir Srinivas, i.e., the named inventors of the above-identified patent application.
- III. Conception: Prior to April 23, 2003, we conceived the inventions currently presented in independent claim 1 of the above-identified patent application. Claim 1 is attached hereto as Exhibit A. Claim 1 is exemplary of an embodiment of the inventions. Exhibit B includes a listing of files related to a product that is representative of the embodiment claimed in the exemplary independent claim 1. Exhibit B is intended to show conception prior to April 23, 2003. Exhibit B includes documentations that were created prior to April 23, 2003. The dates of each file have been redacted. Exhibit B includes the following documents:

B1: NMS Release 1.0 Functional Specification

B2: User Management Screen Shots

B3: Trapeze Networks JumpPad Screen Shots

B4: NMS-Schedule

Exhibit B correlates to the exemplary independent claim 1. These correlations are for the purpose of example only, and not intended to limit the scope of the claims. TABLE 1 provides a rough correlation between Exhibit B and, for example, independent claim 1:

TABLE 1

EXHIBIT B (Examples only)	CLAIM 1
<p>B1)</p> <ul style="list-style-type: none"> • Functional Specification (pg. 6) <ul style="list-style-type: none"> ○ The Network Management Solution ("NMS") provides a solution to configuration/provisioning management, performance management, fault management, client management associated with wireless networks. • Planning Network (pg. 7) <ul style="list-style-type: none"> ○ The user defines a network plan. The user is able to operate in either a "logical view" or a "topological view". (pg. 7, 1. Plan Network). ○ Planning involves creating new network plans or working with existing ones (pg. 30, 3.1 Network Plans). • Deploying Network (pg. 7) <ul style="list-style-type: none"> ○ The user physically installs devices such as APs. (pg. 7) <p>B2)</p> <ul style="list-style-type: none"> • Management software screen shots. <p>B3)</p> <ul style="list-style-type: none"> • Trapeze Networks JumpPad Screen Shots <ul style="list-style-type: none"> ○ Trapeze Networks JumpPad shows screen shots captured from the working prototype. <p>B4)</p> <ul style="list-style-type: none"> • NMS-Schedule <ul style="list-style-type: none"> ○ The timeline shows the original project schedule from implementation to network performance updates 	<p>(a) A method of planning a wireless local area network, comprising:</p>

<p>B1)</p> <ul style="list-style-type: none"> • Topological view (pgs. 11-12, 1.2.2.2 Topological View) <ul style="list-style-type: none"> ○ A topological view of the network shows topological objects like sites & buildings. The topological view displays all elements contained in the topological element. ○ In defining topological objects (pg. 31, 3.1.2.), the user selects, places, configures site, building, floor or walls. • Floor/Building/Site Level Performance (pg. 80) <ul style="list-style-type: none"> ○ The user selects a floor, building or site. <p>B3)</p> <ul style="list-style-type: none"> • Trapeze Networks JumpPad Screen Shots <ul style="list-style-type: none"> ○ Trapeze Networks JumpPad shows screen shots captured from the working prototype. <p>B4)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. 	<p>(b) receiving floor plan data about a site for the wireless local area network;</p>
<p>B1)</p> <ul style="list-style-type: none"> • Selecting a topology object or pre-defined coverage area (pg. 37) <ul style="list-style-type: none"> ○ In order to validate the coverage, the user must select a coverage area. This could be an existing topology object or could be a coverage area. (pg. 37) • Verification (or validation) of the network occurs at different phases. <ul style="list-style-type: none"> ○ Verification, for instance, of network configuration data occurs against the entire plan. (pgs. 53-56). <p>B3)</p> <ul style="list-style-type: none"> • Trapeze Networks JumpPad Screen Shots <ul style="list-style-type: none"> ○ Trapeze Networks JumpPad shows screen shots captured from the working prototype. <p>B4)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. 	<p>(c) receiving coverage data about the site for the wireless local area network;</p>

<p>B3)</p> <ul style="list-style-type: none"> • Trapeze Networks JumpPad Screen Shots <ul style="list-style-type: none"> ○ Trapeze Networks JumpPad shows screen shots captured from the working prototype. <p>B4)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. 	<p>(d) receiving capacity data about the site for the wireless local area network; and</p>
<p>B1)</p> <ul style="list-style-type: none"> • Menu Bar (pgs. 14-19) <ul style="list-style-type: none"> ○ The File/Edit/View menu provides the user with a variety of file based functions. • Verification of Network Configuration Data (pgs. 56-59) <ul style="list-style-type: none"> ○ The user changes the configuration and the changes will be verified before deployment. • Changes of Network Configurations (pg. 60) <ul style="list-style-type: none"> ○ The user can view or modify the configurations of the devices, VLAN or plan at any time. (pg. 60). • Performance Management (pgs. 75-81) <ul style="list-style-type: none"> ○ All performance parameters are accessible from the configuration views of the network. (pg. 75). <p>B3)</p> <ul style="list-style-type: none"> • Trapeze Networks JumpPad Screen Shots <ul style="list-style-type: none"> ○ Trapeze Networks JumpPad shows screen shots captured from the working prototype. <p>B4)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. <p style="text-align: center;">•</p>	<p>(e) based at least on the floor plan data, the coverage data, and the capacity data, determining quantity, placement, and configuration of a plurality of access points of the wireless local area network.</p>

IV. Diligence: We diligently constructively reduced the invention to practice on September 17, 2003. Attached, with dates redacted, as Exhibits C1 through C4 (collectively "Exhibit C") are exemplary documents produced between April 23, 2003 and constructive reduction to practice. It should be noted that Exhibit C1 and B4 are the same. The date associated with this document is a range that extends from before April 23, 2003, making it suitable for showing conception, and to after April 23, 2003, making it suitable for showing diligence. These documents are in chronological order, and have redacted dates which occurred at irregular intervals but without interruption extending from our conception of the invention to our constructive reduction to practice of the invention. Exhibit C includes the following documents:

C1: NMS-Schedule

C2: NMS 1.0 Software Design Specification

C3: Ringmaster Release 1.1 Functional Specification

C4: Ringmaster 2.0 Functional Specification

Exhibit C correlates to the exemplary independent claim 1. These correlations are for the purpose of example only, and not intended to limit the scope of the claims. TABLE 2 provides a rough correlation between Exhibit C and, for example, independent claim 1:

TABLE 2


EXHIBIT C (Examples only)	CLAIM 1
<p>C1)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. <p>C2)</p> <ul style="list-style-type: none"> • RF Planning Tool (pg. 4) <ul style="list-style-type: none"> ○ The primary goals of RF Planning Tool include creating a coverage area, designing wireless network, defining obstacles in floor, assigning channels to different Access Points. (pg. 4). ○ Network design can be launched from the floor wizard. (pg. 10). ○ Network planner would perform defining a floor, obstacles, a coverage area or specifying certain constraints or deploying changes. (pgs 4-6). • RF Interference is a big problem in WLAN. The presence of RF obstacles within a floor can be seen on the actual coverage devices. (pg. 23). <p>C3)</p> <ul style="list-style-type: none"> • Planning Tool <ul style="list-style-type: none"> ○ New implementation of planning tool will be able to handle the following coverage areas: concave shaped coverage areas and shared coverage areas. (pgs. 18-19). <p>C4)</p> <ul style="list-style-type: none"> • RF Planning <ul style="list-style-type: none"> ○ Ringmaster RF Planning requires the user to select the appropriate chassis type they want to deploy in their network. (pg. 13). 	<p>(a) A method of planning a wireless local area network, comprising:</p>

<p>C1)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. <p>C2)</p> <ul style="list-style-type: none"> • Floor Definition <ul style="list-style-type: none"> ○ A floor wizard controls the definition of floor. A wizard defines various factors such as partitions and floor attributes. (pgs. 7-9). • Information Model <ul style="list-style-type: none"> ○ Information Model displays floor information such as background image, ceiling attenuation factor, obstacles. (pgs. 13-14). • Obstacles <ul style="list-style-type: none"> ○ The user can define obstacles and assign attributes such as attenuation factor. (pgs. 13-14). ○ The user will have to manipulate the floor plan. (pg. 38). <p>C3)</p> <ul style="list-style-type: none"> • RF Obstacles <ul style="list-style-type: none"> ○ The attenuation factor of a RF obstacle is same in 802.11b and 802.11g. (pg.11). • Channel Assignment <ul style="list-style-type: none"> ○ When channel assignment is performed for the entire floor, all 801.11b and 801.11g radios will be considered to reduce co-channel interference. (pg. 12). • Floor View <ul style="list-style-type: none"> ○ A new icon which allows viewing the RF coverage will be added. (pg. 15). ○ Network topology verification is implemented with the introduction of 802.11g. (pg. 16). • Planning Tool <ul style="list-style-type: none"> ○ New implementation of planning tool will be able to handle the following coverage areas: concave shaped coverage areas and shared coverage areas. (pgs. 18-19). <p>C4)</p> <ul style="list-style-type: none"> • Network Topology Verification <ul style="list-style-type: none"> ○ Network topology verification is an important feature in Ringmaster. (pg. 13). 	<p>(b) receiving floor plan data about a site for the wireless local area network;</p>
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<p>C1)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. <p>C2)</p> <ul style="list-style-type: none"> • Coverage Area Definition <ul style="list-style-type: none"> ○ This can be performed using In Floor Layout featured in the tool bar. (pg. 10). ○ Network design shows the list of coverage areas in the floor. (pg. 11). ○ Coverage area is a portion of the floor where the user desires certain WLAN connectivity. (pg. 14). ○ A coverage area has attributes such as user-specified area, average number of users. (pg. 14). • In network design, a set of constraints are specified and the list of coverage areas in the floor are selected for computation. (pgs. 10-11). • Information model includes coverage area data. (pg. 14) <ul style="list-style-type: none"> ○ Coverage area is a portion of the floor where the user desires certain WLAN connectivity. (pg. 14). • Furthermore, in designing RF Network, the user must specify one coverage area or a set of coverage areas at a time. (pg. 16). <p>C3)</p> <ul style="list-style-type: none"> • There is a design constraint that the user is allowed to select. This constraint will become an attribute on coverage area. (pg. 8). • The user can choose 802.11g only or 802.11a and 802.11g in creating a coverage area. (pg. 10). <ul style="list-style-type: none"> ○ Coverage area will have an additional attribute to allow/disallow 802.11b clients. (pg. 10). • RF Coverage <ul style="list-style-type: none"> ○ A user must specify if contours are needed. If a coverage is selected, it will draw RF coverage for the technology of the coverage area. (pg. 12). ○ Wherever the coverage area is shown, the menu shows "Coverage Area". (pg. 14). <p>Planning Tool</p>	<p>(c) receiving coverage data about the site for the wireless local area network;</p>
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<p>C1)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. <p>C3)</p> <ul style="list-style-type: none"> • Capacity based computation <ul style="list-style-type: none"> ○ It becomes critical in MP count computation that 802.11g radio can accept 802.11b clients. (pg. 11). 	<p>(d) receiving capacity data about the site for the wireless local area network; and</p>
<p>C1)</p> <ul style="list-style-type: none"> • NMS-Schedule The timeline shows the original project schedule from implementation to network performance updates. <p>C2)</p> <ul style="list-style-type: none"> • Design and Computation <ul style="list-style-type: none"> ○ The user selects the coverage areas for computation and upon finishing computation, the new Access Points will be shown. (pgs. 10-11). • Assigning Channels <ul style="list-style-type: none"> ○ A wizard will ask the seed AP and Channel to automatically assign channel numbers to the other APs. (pg. 12). • Design Constraints <ul style="list-style-type: none"> ○ The network planner provides certain constraints such as max. AP-DP distance, existing APs. (pgs. 14-15). • RF Network Design Computation <ul style="list-style-type: none"> ○ The user must specify the following pre-requisites: location of wiring closet, coverage area and so on. (pg. 16). • AP Computation <ul style="list-style-type: none"> ○ The crux of designing RF Network is to place APs for optimal coverage. (pg. 16). <p>C4)</p> <ul style="list-style-type: none"> • Deploying MP configurations <ul style="list-style-type: none"> ○ The user deploys the MP configuration in deploying MP configurations. (pg. 17). 	<p>(e) based at least on the floor plan data, the coverage data, and the capacity data, determining quantity, placement, and configuration of a plurality of access points of the wireless local area network.</p>

- V. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, (18 U.S.C. §1001) and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.


Allan Thomson

Date: 12/7/05


Sudhir Srinivas

Date: 12/9/05



Exhibit A

Claim 1

- 1. A method of planning a wireless local area network, comprising:**
 - receiving floor plan data about a site for the wireless local area network;**
 - receiving coverage data about the site for the wireless local area network;**
 - receiving capacity data about the site for the wireless local area network; and**
 - based at least on the floor plan data, the coverage data, and the capacity data,****determining quantity, placement, and configuration of a plurality of access points of the wireless local area network.**

NMS RELEASE 1.0 FUNCTIONAL SPECIFICATION

PROJECT NAME "JUMPPAD"

Revision 0.9G

[REDACTED]

AUTHORS: Allan Thomson, Yun Freund, Jim Bugwadia

Trapeze Networks Proprietary

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Revision	Who	Date	Description
0.1	Allan		Original
0.2	Yun		Added more detailed tree view and map view for the configuration management, added details on performance and fault management
0.3	Allan		Refinements
0.4	Yun		Modify after review with Allan
0.5	Allan		Updates to the performance and fault areas
0.6	Yun		Updates to the Configuration section
0.7	Jim		Added use cases for config, fault and performance.
0.8	Allan		Various updates across the document including installation, overview, HP OV and re-organize various sections. Added a host of comments to be worked on.
0.9	Yun		Added image download, FS support, and Deploy section; Fixed PM and FM based on Allan's comment
0.9a	Yun & Jim		Changes to Install, Plan & Deploy sections. Added more details & GUI views throughout. Added State models for device.
0.9b	Jim		Completed Planning section with coverage planning details.
0.9c	Yun		Added Section 6 Configuration Support
0.9d	CT		Added Section 5: Verify
0.9e	Jim		Filled in NMS persistency section
0.9f	Allan		Minor updates and corrections.
0.9g	Yun		Added Client Management Section 6.8

Exhibit B

Conception

1 INTRODUCTION

1.1 GOALS AND SCOPE

The goal of this document is provide a functional specification of the **Trapeze Networks** network management product. It is not intended to be a software design specification or define future release requirements or functionality. It is strictly focused on the release 1.0 product capabilities.

NOTE: The internal product name is "JumpPad". We use "JumpPad" throughout this document and this name will be replaced by the eventual product name in all distributed software and manuals.

1.2 OVERVIEW

The primary focus of the network management solution in the 1.0 timeframe is to provide a solution to the following functional areas associated with managing Trapeze Wireless networks:

- Configuration/Provisioning Management
 - It is really important that we provide tools to enable a network manager to easily plan and provision networks built from our equipment.
 - The tools must encompass configuration for new networks as well as existing deployed networks and manage both images and configurations in an integrated way.
- Performance Management
 - For our networks it will be critical that we provide tools to understand how the network is performing for both the wired and wireless parts.
- Fault Management
 - Faults in the network, particularly wireless, will be common place and it is necessary we provide insightful ways of showing and highlighting issues that are occurring in live networks.
- Client Management
 - As part of the solution we will provide mechanisms to find clients in the network and do basic performance/fault management for those clients.

Other key goals for this product are:

- Easily installed and running quickly.
 - No complicated installation or pre-installation requirements. The product should be downloadable from the web and running within minutes of installation.
- Demo friendly.
 - For our company to be successful, it is CRITICAL that the network management product gives a great demo to our customers and allows us to show the full

capabilities of the network products. It should clearly highlight the company/product differentiators.

- Integrates with existing customer tools
 - Most enterprise networks consist of OEM equipment and therefore other tools will be required by a network manager if they are managing such environments. We have to co-exist with such tools gracefully and not assume or require that the customer is running only our solution.

Our tool will target fitting into a network manager's workflow rather than forcing the network manager to change how they do their job. Most network manager's follow the common steps described below. These steps are not a strict sequence, as depicted by Figure 1:

1. *Plan Network*

- The user defines a network plan. The goal is to easily define devices (DPs, APs, etc.) and topological elements like sites, buildings, floors, etc and mappings between the two. The user is able to operate in either a "logical view" where the network plan is presented as a list of devices and connections, or a "topological view" where the network plan also contains buildings, floors, etc (and the mappings between devices and the topology.) A logical view shows a containment view with DPs, APs, and links, regardless of where they are located. A topological view allows the user to see which devices are contained in, for example, a floor regardless of their device associations. It is possible that the user does not define any topological elements in which case only the logical view is available.

2. *Deploy Network*

- The user (or someone) physically installs the devices. Next, the user will select a set of network elements in a network plan and change them to a managed state and deploy a configuration to them. This will cause the application to initiate communication with the network elements. The user must be able to do this in a piecemeal fashion (mainly to allow a steady growth of networks.)

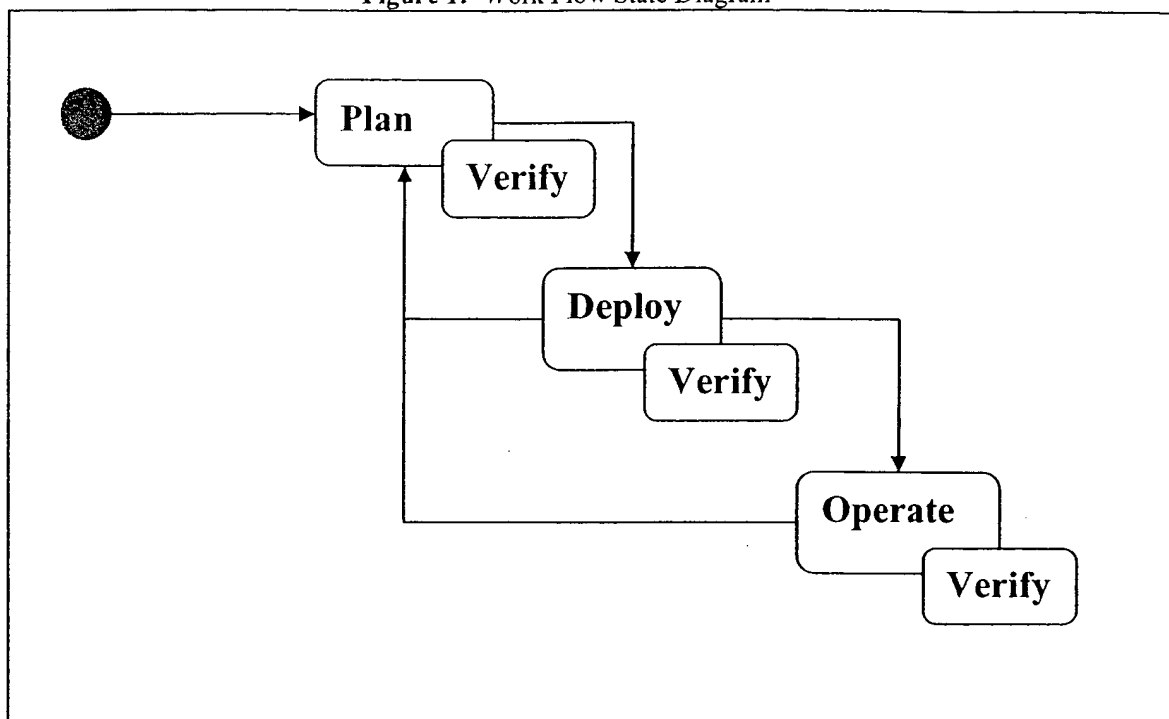
3. *Operate Network*

- In this mode the user performs "normal" day-to-day operation of the system. Also, the user can easily start augmenting and growing the network (which puts them back into the plan-deploy-verify steps.)

4. *Verify Network*

- The user runs a set verification tests on the parts of or the entire network configuration. Verification could really occur during planning, deployment or operation. The user will verify network configuration during planning. The user can also run validation algorithms on a planned network to see problems in the network coverage. Once the network is deployed, the user will verify the installation against the planned (for example, checking if a DP reports a planned number of APs.) The user will also need to easily detect problems in coverage and use. The user is also able to verify the configuration of a device. Any of these functions can be invoked when the network is in operation.

Figure 1: Work Flow State Diagram



1.2.1 APPLICATION FUNDAMENTALS

1.2.1.1 MANAGED VS UNMANAGED DEVICES

The application will provide the user with the ability to manage or unmanage devices. For managed devices, the application will communicate the changes to the device when the user decides to “deploy” the changes. If changes are made to an unmanaged device, the changes are only applied to the local copy of the network configuration and no attempt will be made to communicate with the device on the network. This allows us to provide offline creation of network configurations before the network exists or has IP connectivity.

1.2.1.2 OFFLINE CONFIGURATION CHANGES

The application will provide an offline configuration workflow. That is, the user will make a set of changes to the network configuration within the application and those changes will be recorded in a *change set*. For a set of changes to be applied to the actual network, the user will invoke the “Deploy” option. If the user exits the application without deploying the changes or the changes were applied to devices not actually managed on the network yet, the changes will be stored offline and the next time the plan is opened those changes will be re-applied to the current view of the configuration.

Performance and Fault functions will only be permitted on network configurations that are managed in the network. This means that if the user chooses to monitor the performance of a VLAN not yet deployed the application will inform the user that it is not possible to perform this function until the changes are deployed. Similarly, any fault functions provided by the application will only work if the device is managed and that function applies to a piece of the network configuration that exists on the device in the network.

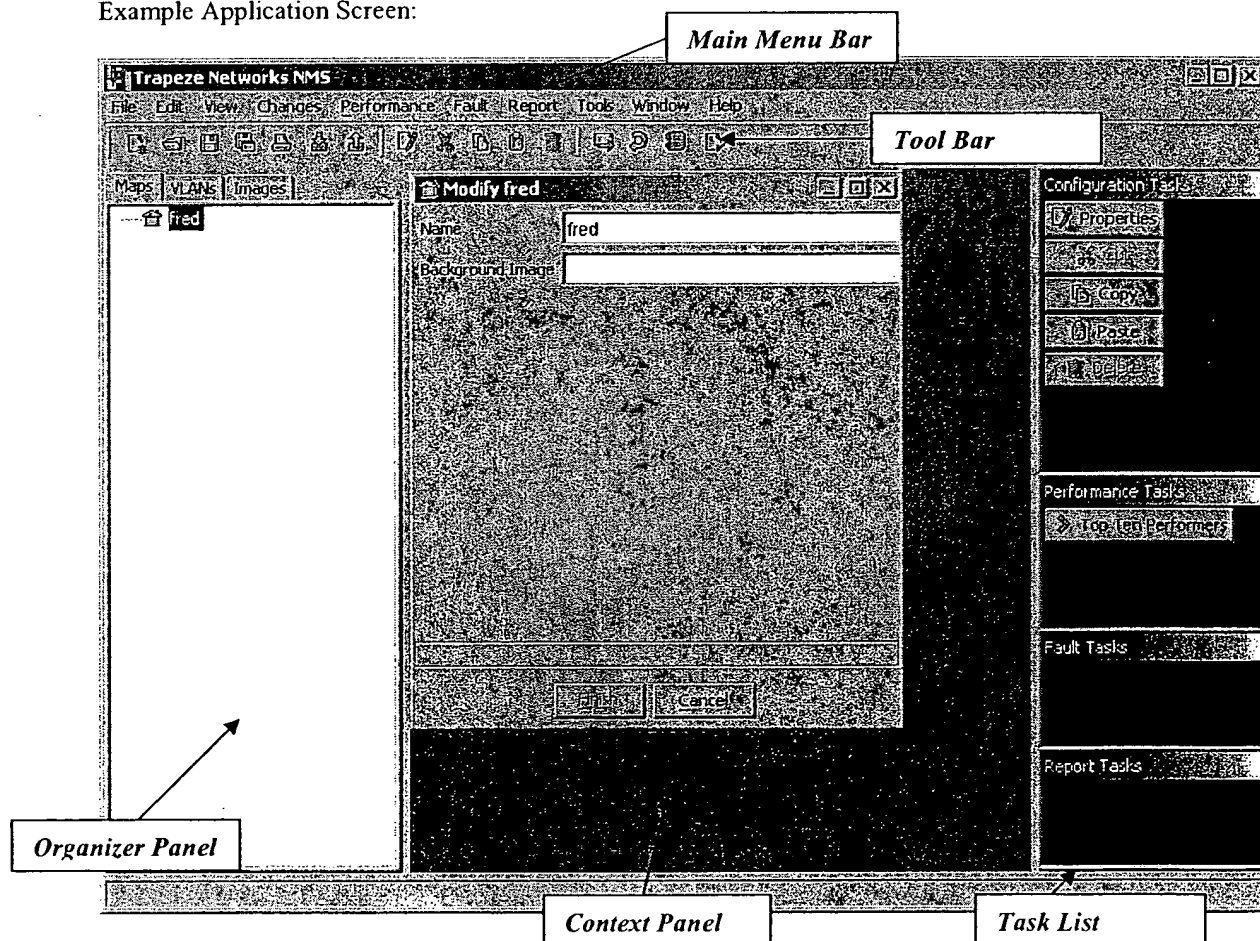
1.2.1.3 VERSIONING SUPPORT

The product will support versioning of the DP/AP product capabilities. That is, it will support multiple versions of the images and their associated capabilities. A device capability can be a difference in configuration model (e.g. new features, extended limits...etc), performance management changes (e.g. additional parameters being added to the data returned for statistics) and fault management changes (e.g. additional parameters being added). As part of DP/AP configuration, an image version will be associated with each device. This version will define the capabilities the product will support from a configuration capability. For our product it is a requirement that the product supports multiple image versions in a single version of the JumpPad product. For 1.0, this will not be a big issue, but with future rollouts of images it is critical that the product be easily adapted to handle the differences in device capabilities.

1.2.1.4 GENERAL LOOK AND FEEL

The application will use the default look and feel of the OS it is installed upon. For Windows XP/2000 this will default to the Windows look and feel. For Solaris, this will default to the Motif look and feel.

Example Application Screen:



The application will consist of:

- Main Menu Bar. This will provide the user the main navigation to the set of functions provided by the application.

- Tool Bar. This will provide shortcuts to the set of functions in the menu bar.
- Organizer Panel. This will provide a tree hierarchy structure to the various views the user can navigate in.
- Context Pane. This will provide the user with a variety of views for configuration/fault/performance of the network.
- Task List. This will provide the user with a set of available functions for the current selection.
- Context Popup Menu. A popup menu will be displayable for each object and will provide the set of related functions for the current selections. The product will support multi-select of objects and therefore this context menu will be based on the first selection rather than all.

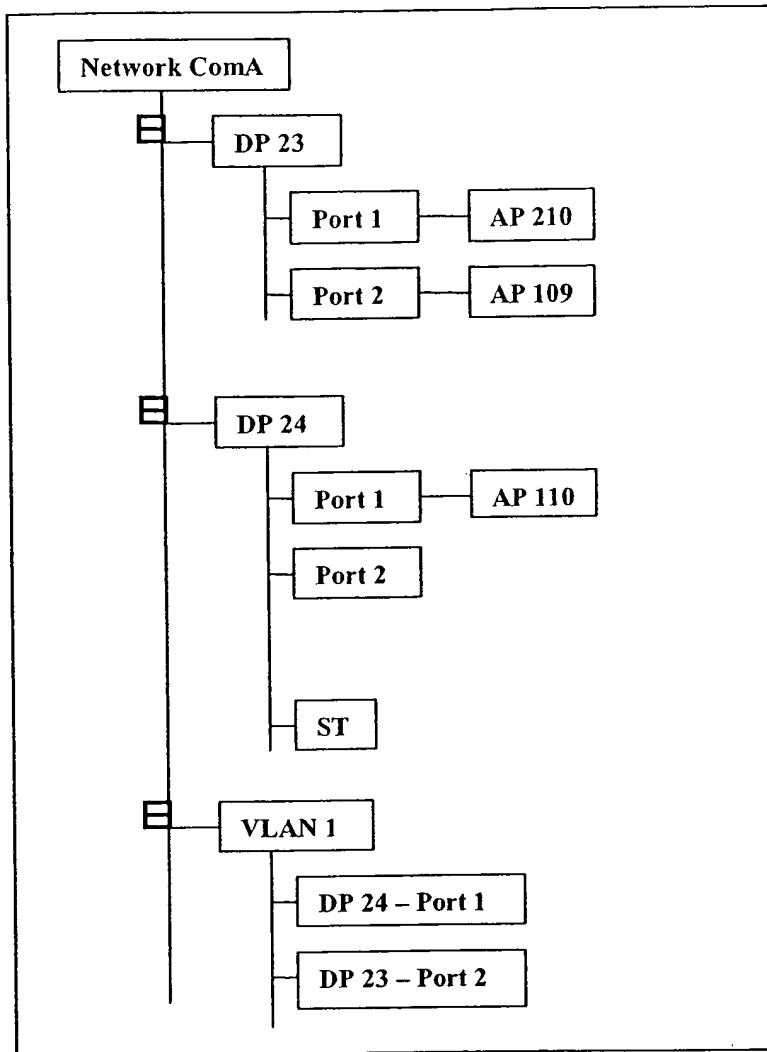
1.2.2 ORGANIZER PANEL

The Organizer Panel will allow the user to easily view the network from either a logical containment view or from a topological view. Ultimately, both views allow the user to see the DPs, APs and other elements of the network. By selecting an element on the panel, the user can:

- Right-click on it to see a list of available operations. This will include a menu option to display a pop-up window with the configuration details of the selected element (this may not make sense for all objects, and will be context-sensitive.)
- Double-click on it to focus the context panel to that object.

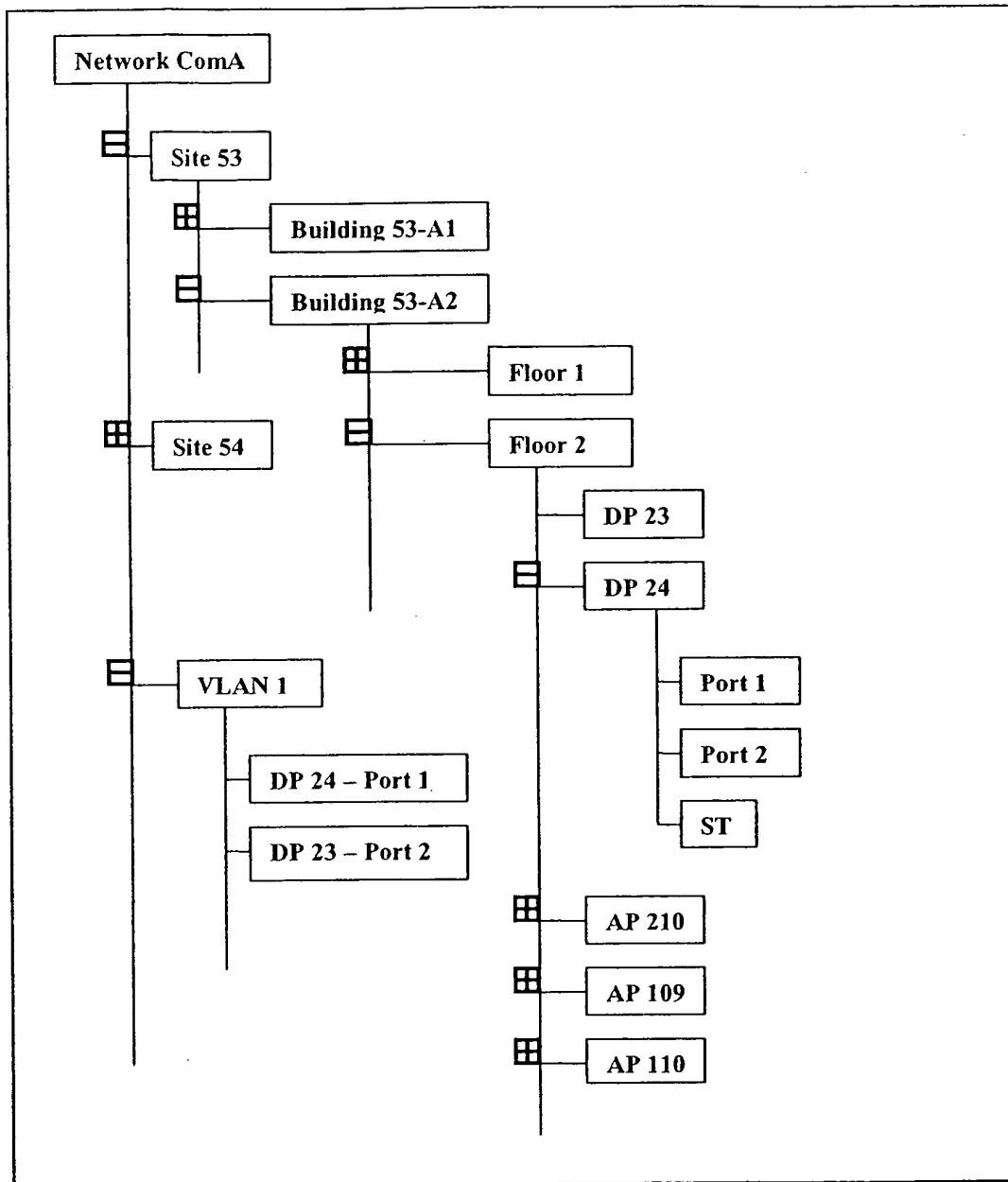
1.2.2.1 LOGICAL VIEWS

A logical view is a containment tree of devices. These do not show any topological elements, like sites, buildings and floors. Using the logical view the user can select a device. To show more information for the device the user can right-click and select a menu option to display its configuration. For example doing this on a port will show if it is connected to an AP, which VLAN it is part of, etc.



1.2.2.2 TOPOLOGICAL VIEW

A topological view of the network shows topological objects like sites & buildings. One point to note: APs may be connected to DPs in a different location (e.g. a different floor or building.) Hence, the topological view displays all elements contained in the topological element. By expanding on a DP, a user will be able to see the APs that it is connected to regardless of their location.



1.2.2.3 VLAN VIEWS

VLANs are seen in both logical and topological views, and can also be accessed using a separate VLAN view.

Since VLANs can span top-level network & topological elements, they are shown directly under a plan in both logical and topological views. For any element, its VLAN associations can also be obtained by using a right-click menu option.

The VLAN view shows only the VLANs under the plan – i.e. all other elements are filtered out.

1.2.2.4 USING THE VIEWS

For any network element, the user can select a menu option to either show the location, or show its logical associations. This allows the user to quickly navigate to the desired information. Also, if the user has selected a network element and then switches modes, the same element will become the focus of the new mode. Hence a user can select an AP in a topological view, and then switch to a logical view to see what DP it is connected to.

If a user select an element in logical or topological view, and then switches to a VLAN view, all VLANs that the device is part of are highlighted in the VLAN tree.

1.2.3 CONTEXT VIEWS/EDITORS

The Context Views/Editors provide various windows that show topology, allow the user to edit parameters for objects, show performance, show alarms...etc.

1.2.4 SELECTION OPTIONS PANEL

The Selection Options Panel provides a quick way for the user to see the options available for the current selection. For example, if the user chooses a port, they can choose to edit parameters, graph performance, show alarms...etc. The selection options panel is just another toolbar with text and icons shown and is context based so that the options available for this object are only shown when that object is selected. This panel is closeable.

1.2.5 MENU BAR

All the Menu items under the menus are context-sensitive. All of the menu items are enabled or disabled based on that what the current selected object is. For example, under the context of "Floor", the "Insert" menu item will only show up the "DPChassis", but not the "Port" submenu item.

1.2.5.1 FILE MENU

The File menu provides the user with a variety of file based functions such as creating new network plans, saving network plans, importing/exporting configuration/image files...etc. This following menu items are currently supported under File menu:

- **New Menu Item**
 - This New menu item will enable the user to start a new network plan. It will prompt the user to enter a new network plan name it is selected.
- **Open Menu Item**
 - Open Menu item provides the user to open an existing network plan, whether it is an active plan or undeployed network plan.
- **Save Menu item**
 - This menu item provides the user to save the existing network plan. If it is first
- **Save As Menu Item**
 - This menu item allows the user to save the network plan to a file on the local disk.
- **Print Menu Item**
 - This menu item allows the user the print the existing network plan or map view.
- **Import Menu Item**
 - This menu item will allow the user to import configuration files defined in CLI or XML format into the system.
- **Export Menu Item**
 - This menu item will allow the user to export device configurations to either CLI or XML format files on the local hard disk.
- **Exit Menu Item**
 - This menu item will exit the Trapeze JumpPad system.

1.2.5.2 *EDIT MENU*

The edit menu provides the user with a variety of current options available for the currently selected object. The following menu items are provided:

- **Insert Menu Item**
 - Insert Menu Item provides the user the ability to add any allowed objects under the current context. For example, if the Floor object is currently selected, the Insert menu item will give the option of inserting DPChassis under the Floor.
- **Properties Menu Item**
 - This menu item allows the user to view or modify the configuration information of that selected object such as Chassis or port.
- **Cut Menu Item**
 - This menu item allows the user to delete an object based on the currently context. For example, delete a DP or AP from the network.
- **Copy Menu Item**
 - This menu item provides the user the capability to do the object cloning. For example, clone the same AP configuration of a selected AP.
- **Paste Menu Item**
 - This menu item provides the user to paste the Copied objects to a different location or hierarchy.
- **Online/offline Menu Item**
 - This menu item provides an easy way to change the state of the Chassis to offline, or online.

1.2.5.3 *VIEW MENU*

The view menu provides the user with the ability to switch between different views and for the current view provides options to change that view. The following menu items are provided:

- **Map Menu Item**

- Map Menu Item provides the map view of the existing network plan. This menu item is the same tab shown on the left-top of the Organizational Panel.

- **VLAN Menu Item**

- VLAN Menu Item provides the logical view of the VLANs, DPs, and APs, and their connectivity.

- **RF Coverage Menu Item**

This option allows user to view the coverage of a Network plan; this may includes Building, Floor, VLAN, and DP saturation for each site within a Network Plan.

- **Images Menu Item**

- Images View shows a list of DP and AP config files and images and provides a list of functions to manage the image file and provides download to the DPs.

- **Task List Menu Item**

- This menu item provides the user a list of functions to toggle on and off the Configuration Task List on the right side of the Context view.

- **Toolbars Menu Item**

- This menu item provides an easy customization of the Tool Bars and the user can choose to select and deselect the short-cut of each menu on the tool bar.

1.2.5.4 CHANGES MENU

The changes menu provides the user with the ability to save network changes, discard changes...etc. The following options are available in the JumpPad system:

- **Deploy Menu Item**
 - This will allow the user to deploy the network plan to the network devices.
- **Revert Menu Item**
 - This option allows the user to revert the changes back to the previous state of the configuration view before the user made any changes.
- **Review Menu Item**
 - This menu item allows the user to review the changes that they have made in the current view.
- **Verify Menu Item**
 - This option allows the user to verify the network plan for configuration errors. For example, the differences between the actual and planned configuration are identified.

1.2.5.5 PERFORMANCE MENU

The Performance menu allows the user to retrieve and view the Performance and Statistics of the selected object, such as VLAN, Chassis, and port. All options are context sensitive and will show the performance information for a particular selected set of objects. If the user does not select a particular object the option will provide the user with a list of objects that the function may be performed on.

- **VLAN Menu Item**
 - VLAN Menu Item provides the Graph and Chart Statistics for the VLAN.
- **Chassis Menu Item**
 - Chassis Menu Item provides the Graph and Chart Statistics for a selected Chassis.
- **Port Menu Item**
 - Port Menu Item provides the Graph and Chart statistics for a selected port.

1.2.5.6 *FAULT MENU*

The Fault menu allows the user to retrieve and view Fault/Event log of the selected object, such as VLAN, Chassis, and port. The user should be able to select any object such as a DP, or a port, and launch the Fault Viewer for that particular object. All options are context sensitive and will show the fault information for a particular selected set of objects. If the user does not select a particular object the option will provide the user with a list of objects that the function may be performed on.

- **VLAN Menu Item**
 - VLAN Menu Item provides the Fault/Event Viewer for the VLAN.
- **Chassis Menu Item**
 - Chassis Menu Item provides the Fault/Event viewer for a selected Chassis.
- **Port Menu Item**
 - Port Menu Item provides the Fault/Event Viewer for a selected port.

1.2.5.7 *REPORT MENU*

The Report menu allows the user to generate and export the report on the selected object, such as VLAN, Chassis, and port. The user should be able to select any object such as a DP, or a port, and allows the sub selection whether on Configuration, statistics, or event/fault report.

- **VLAN Menu Item**
 - VLAN Menu Item generates the report for the VLAN. User needs to select a particular VLAN and launch the Fault menu. Under this menu
- **Chassis Menu Item**
 - Chassis Menu Item provides the Fault/Event viewer for a selected Chassis.
- **Port Menu Item**
 - Port Menu Item provides the Fault/Event Viewer for a selected port.

Issue: More importantly the user wants to generate report not only on the physical configuration, but also Performance/Statistics.

1.2.5.8 TOOLS MENU

The tools menu provides launch points for the tools we may integrate into the application.

- **Preferences Menu Item**
 - This menu item provides the user to specify User preferences such as Font, Color, and organization of the window etc.
- **Security Menu Item**
 - This menu item allows the user to manage security features, such as user-based authentication.
- **Launch Telnet Menu Item**
 - This menu item provides a launch point for the telnet window against a selected set of devices.
- **Launch Web Browser Menu Item**
 - This menu item allows the user to launch the web browser against a selected set of devices.

1.2.5.9 WINDOW MENU

The window menu provides the user with the ability to control the current windows in the MDI pane

- **Cascade Menu Item**
- **Tile Horizontal Menu Item**
- **Tile Vertical Menu Item**
- **Arrange Menu Item**
- **Close All Menu Item**
- **Help Menu**

The help menu provides launch points into the online help system. In 1.0 this is likely to be a PDF file.

- **About Menu Item**
- **Index/Search Menu Item**
 - This menu item provides the indexing and searching capability of the online Help file.

1.3 PLATFORM SUPPORT

1.3.1 OPERATING SYSTEMS

The following operating systems will be supported in the first release.

- Windows XP
 - Minimum requirements: 256MB RAM, 30MB free disk space, 1024x768 screen resolution, and 24-bit color.
- Windows 2000
 - Minimum requirements: 256MB RAM, 30MB free disk space, 1024x768 screen resolution, 24-bit color
- Solaris
 - Minimum requirements: 512MB RAM, 30MB free disk space, 1024x768 screen resolution, 24-bit color

1.4 SCALING REQUIREMENTS

The system will target the following size of networks:

- 50 DPs
- 1000 APs
- 5000 Users

This is by no means a theoretical maximum, but a single installation of JumpPad should handle this number of devices comfortably.

2 SETUP

Before the user begins planning and operating a network some basic preliminary tasks must be performed. This section describes such tasks.

2.1 INSTALLATION

The product will have various installation options, all of which are supported by Install Anywhere (a commercial Java installation product):

- From CDROM
- From the Web (Web Start will be supported only in post 1.0 release)

All options will download a single installer executable that unpacks itself and then install the product. All installations will install a JVM as part of the installation. We will use Java 1.4 JRE from Sun for all supported platforms. The JRE will be installed as part of the installation and we will not require the user to have a JRE pre-installed.

2.1.1 JUMPPAD INSTALLATION

The JumpPad installer will consist of a single main self-installer that installs all required files for the JumpPad (including JVM). The JumpPad application will be installed under the following default directories under different platforms:

On Windows (2000 and XP) platforms:

\Program Files\Trapeze Networks\JumpPad

On Solaris platforms:

/opt/trapezenetworks/JumpPad/

The installed directory structure under either install directory will be:

<i>\bin</i>	<i>(with all the executables and startup scripts)</i>
<i>\lib</i>	<i>(with all the jar files)</i>
<i>\db</i>	<i>(with all the persistent data like dxf files, config xmls etc)</i>
<i>\images</i>	<i>(with all the images downloads)</i>
<i>\help</i>	<i>(online help files, probably HTML file format)</i>
<i>\hpov</i>	<i>(HP Openview integration files including installer)</i>
<i>\jre</i>	<i>(The JVM that is required for our product to run)</i>

We will provide a HP OV plug-in installer that can be invoked by the user manually after installation of the JumpPad. We will provide a check in the main installer that will see if HP OV is installed on the

machine and prompt the user if they want to run the HP OV plug-in installer after the main installer is complete. All files for the HP OV will be installed under our install directory and the plug-in installer will then install from there to the HP installation directories.

2.1.2 JUMPPAD UNINSTALL

JumpPad1.0 will uninstall all the components including 3rd party components if there are any. We will leave zero footprint on the machine if uninstall is successful.

We will recommend in the 1.0 timeframe that all previous versions of the JumpPad (i.e. beta/test versions) be uninstalled before continuing to install the product. We will provide a check in the installer that test for previous installations (on Windows this will be a registry check, Solaris?). If the test finds a previous version the user will be able to continue but we will automatically move everything out of the way before continuing the installation.

Subsequent releases (post 1.0) will provide upgrade utilities for the installation and allow the user to install newer versions (patch/minor or major) on top of previous versions. Particularly patch and minor updates will just upgrade the current installation. Depending on the type of changes being released, this may require conversion of existing database files...etc to the newer release.

2.2 MANAGEMENT PLATFORM INTEGRATIONS

HP Openview will be the only supported network management platform supported in the 1.0 timeframe. The goal is minimal integration providing some basic launch points, custom graphics for our nodes in HP OV and enterprise MIB (i.e. traps) support.

All platforms provide Basic L3 topology maps and are common in Enterprise environments. The installation of our product does not require these products to be in use. However, we will not duplicate L3 topology. Topology of the DP/AP will be covered in a later section.

2.2.1 HP OV LAUNCH POINTS

The application will be launchable from the OVW Tools menu. The menu item will be called "Trapeze JumpPad". The user will not be required to select and particular devices to launch our application. Several scenarios exist:

1. A Trapeze Networks network is already deployed and the user is invoking our application for the first time.
 - a. Upon invocation we will ask the user if they want to import devices from the OV database into our application. If yes, the application will read ALL Trapeze devices from the OV database and show them in a logical view. Upon completion of reading the OV database we will prompt the user for a username/password to read the configurations from the devices on the network.
2. The user has run the JumpPad before either from HP OV or manually invoked and has nothing selected in the OV view.
 - a. In this case, we will start the application in a normal mode (i.e. prompt for new plan/open existing plan...etc)
3. The user has run the JumpPad before and has selected a particular device(s) in HP OV.

- a. In this case, we will search our plan database for those devices and open the particular plan that the device is in. If multiple plans exist with the device, we will ask the user which one to open.

Whenever we read information from the OV database we will gather a device's IP address and hostname as a minimum. More information may be read as we find out more about what is in the database.

2.2.2 HP OV REGISTRATION FILES

To integrate with HP we must provide and install registration files that allow our application to be launchable from the HP OV menus. The registration file for our application will be called "trapezenetworks.ovw" and installed in the following locations:

On Windows: C:\Program Files\HP OpenView\NNM\registration\C

On Unix: /etc/opt/OV/share/registration/C

The contents of the file will be mostly as follows:

```
Application "Trapeze JumpPad"
{
    Description {
        "Trapeze Networks JumpPad",
        "JumpPad for Trapeze"
    }

    DisplayString "Trapeze JumpPad";

    Version "JumpPad 1.0 [REDACTED]";

    Copyright {
        "Copyright (c) [REDACTED] Trapeze Networks Company",
        "All rights reserved"
    }

    Command "trpzJumpPad -shared"

    MenuBar <100> "Tools" _T
    {
        <5> "Trapeze JumpPad" _M CONTEXT "AllContexts || isIP"
        f.action "trapeze-JumpPad";
    }

    Action "trapeze-JumpPad" {
        MinSelected      0 ;
        MaxSelected      1 ;
        SelectionRule     (isSNMPSupported || isSNMPProxied) ;
        NameField         "IP Hostname", "IP Address", "Selection Name";
    }
}
```

We will also provide enterprise MIB integration and this will require us to copy the necessary MIB files into the appropriate HP OV directory containing the MIBs. **Details TBD.**

We will also provide custom icons to show Trapeze Networks devices in the HP OV maps and this will require installation of symbol files...etc into HP OV directory structure. **Details TBD.**

2.2.3 SYNCHRONIZING HP OV STATE

Pre-conditions	HP OV is accessible. JumpPad is installed and JumpPad plug-in to HP-OV is installed.
Post-conditions	JumpPad is configured to sync with HP OV.
Main-Flow	<ol style="list-style-type: none"> 1. User selects the Preferences menu option. The preferences dialog will have a HP OV integration panel with various choices. 2. JumpPad will have the following option: <ol style="list-style-type: none"> a. Sync New Nodes. This option will switch on/off our application checking for new Trapeze nodes discovered in HP OV. This option only applies when the application is running already and HP OV discovers a new node and sends an event to us saying a new device is discovered. b. Sync Node Status. This option will switch on/off our application opening a connection to OV on startup. If on, our application will open a connection to the OV database and register interest in events associated with the Trapeze device status. OV provides callback mechanisms so that when events occur (status change) we can receive the event asynchronously. Upon receipt of a node status update from HP OV we will color our device nodes with the same color coding as shown in the HP OV map.
Exceptions	
Alternate Flows	
Notes & Issues	<ul style="list-style-type: none"> • The HP OV integration can be done at any time.

2.3 CONFIGURING USER-BASED AUTHENTICATION

The JumpPad supports a user-based authentication policy that leverages the underlying platforms user management scheme. By default this policy is disabled.

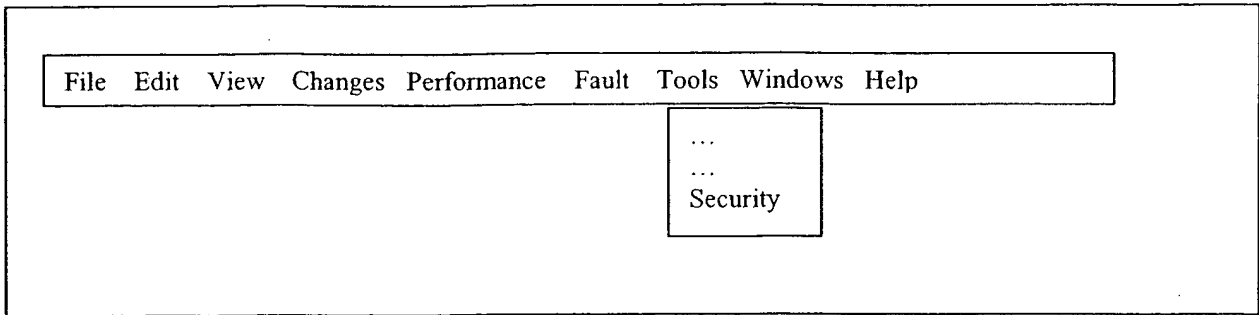
As part of the JumpPad, an administrative user is allowed to turn on the user based authentication and to define a set of users that can use the JumpPad on that system.

2.3.1 USER BASED AUTHENTICATION

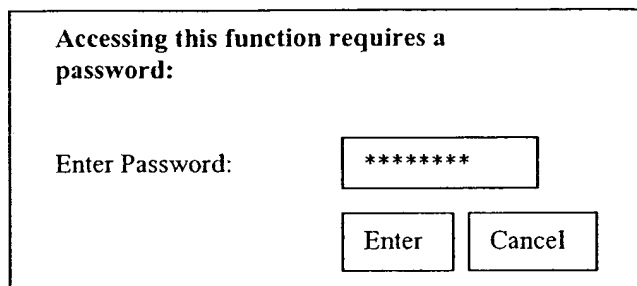
Pre-conditions	JumpPad is installed
Post-conditions	The user-based authentication feature is turned on and a JumpPad user list is created for the system.
Main-Flow	<ol style="list-style-type: none"> 1. The Administrator invokes the User Control function. A password may be required to access this function, based on prior settings (see below.) 2. The Administrator enables user-based authentication. 3. The administrator sets a password for subsequent management of user-authentication. 4. The Administrator defines one or more system user names that are allowed to use the application. 5. The User Control application encrypts the user names and stores them as Java system properties.
Exceptions	2a. The Administrator quits: <ol style="list-style-type: none"> 1. The application informs the administrator that no users are defined, and prompts them to either define a user or turn-off user based security.
Alternate Flows	2a. The Administrator disables user-based authentication: <ol style="list-style-type: none"> 1. No user authentication is performed in future runs of the application. 3a. The Administrator does not set a password for managing user-based authentication: <ol style="list-style-type: none"> 1. No password check is done when the User Control function is invoked. 4a. The Administrator deletes one or more system user names from the existing list. <ol style="list-style-type: none"> 1. The deleted user will not be able to subsequently run the application.
Issues & Notes	

JumpPad will provide a menu option to access the user-based authentication security feature:

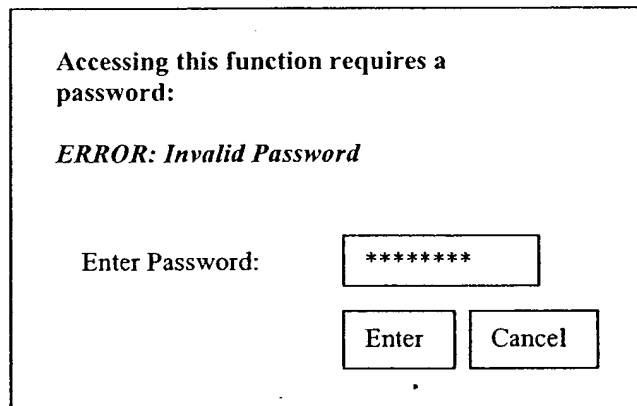
- *Menu Option: Tools -> Security*



This feature can be protected by a password. By default there is no password. Only if a password has been previously set, the user will be prompted to enter it.



If the password does not match, the user will be informed of this error and re-prompted for the password:



Next, the user is then presented with a single screen that allows the management of user-based authentication. Here, the user can:

- 1) Turn the user-based authentication on or off.
- 2) Turn the password protection of user-based authentication on or off.
- 3) Set a password (if password protection is enabled.)
- 4) Add or delete user names that can access the application.

The diagram shows a user authentication interface. At the top, there are two rows of controls. The first row is labeled 'User Authentication:' and has a radio button selected for 'On' and an unselected radio button for 'Off'. The second row is labeled 'Set Password:' and also has a radio button selected for 'On' and an unselected radio button for 'Off'. Below these are two text input fields. The first is labeled 'Password:' and contains '*****'. The second is labeled 'Re-enter:' and also contains '*****'. Below these fields is a rectangular box titled 'User List'. Inside this box, on the left, is a text input field labeled 'User N' and two buttons labeled 'Add' and 'Delete'. To the right of these buttons is a list of users: 'User 1', 'User 2', 'User 3', and '....'. Below the list is a shaded rectangular area labeled 'User N'. To the right of the list and the shaded area is a vertical double-headed arrow, indicating a scrollable list.

[ALLAN: By definition, setting a password turns password security on, I don't believe having an additional toggle button to turn this on/off helps, it is redundant]

2.4 APPLICATION STARTUP

2.4.1 STARTING JUMPPAD

Pre-conditions	JumpPad software is installed
Post-conditions	JumpPad is started
Main-Flow	<ol style="list-style-type: none"> 1. User can start JumpPad using any of the following options: <ul style="list-style-type: none"> • From command line: by typing in the application name • By double-clicking a desktop icon or selecting a desktop menu option. • By using a HP OV launch-point 2. JumpPad checks security policy to see if user authentication is enabled. 3. If user-based security is enabled: <ol style="list-style-type: none"> a. JumpPad retrieves security data b. JumpPad authenticates the user against a pre-defined list of allowed users as

	<ol style="list-style-type: none"> 4. JumpPad retrieves the user's preferences. If none exists, the JumpPad will just use the defaults built into the product. As soon as a preference is changed the JumpPad will save the complete set to the user's specific directory. 5. JumpPad gives the user options to: <ol style="list-style-type: none"> a. Open an existing network plan. If the user had previously used the JumpPad the JumpPad will display a list of "recently opened" plans. b. Start a new network plan.
Exceptions	
Alternate Flows	
Issues & Notes	

On starting up JumpPad, the user is prompted with a dialoge box, as follows:

The dialog box contains the following elements:

- ☐ New Network Plan
 - Enter Name
 - BuildingA-Floor1
- ☒ Open Network Plan
 - Select Network
 - Existing Plan List...
 - BuildingA-Floor1
 - BuildingB-Floor2
- Continue
- Cancel

This box is shown in front of the main application window. If the user hits cancel, the main window stays running, with only the *MENU: File -> New* and the *MENU: File -> Open* functions accessible.

2.4.2 AUTHENTICATING USERS

Pre-conditions	An administrator has built a JumpPad user list with <u>Use Case – Build User List</u>
Post-conditions	User is authenticated and allowed to use the JumpPad.
Main-Flow	<ol style="list-style-type: none"> 1. JumpPad application retrieves allowed user list (which is stored as Java system properties.) 2. JumpPad application uses the Java authorization package to query the system

	<p>about the current user.</p> <ol style="list-style-type: none">3. If the current system user is on the allowed user list, the user is authenticated.4. If the current system user is NOT on the allowed user list, the authentication request is failed.
Exceptions	<ol style="list-style-type: none">1a. Empty user list<ol style="list-style-type: none">1. Authentication request is failed.
Alternate Flows	
Issues	<ol style="list-style-type: none">a. Should authentication be done at a more granular level? E.g. for function groups?b. Are there user levels/privileges: read-only, change, etc.

For valid users there is no password to enter, when they start JumpPad. If JumpPad detects an invalid user, it will inform the user as follows:

ERROR: The user account (User 1) is not configured to use JumpPad. Please inform the JumpPad administrator or re-try with a different account.

Ok

3 PLAN

Planning involves creating new network plans or working with existing ones. A network plan is a collection of network device definitions, topological definitions, maps and background image files.

The user has a number of different options for defining and importing data into a network plan. These are described in detail below:

3.1 NETWORK PLANS

3.1.1 STARTING A NEW NETWORK PLAN

Pre-conditions	JumpPad is installed
Post-conditions	User has created & saved a new network plan.
Main-Flow	<ol style="list-style-type: none"> 1. User starts JumpPad. 2. JumpPad tool authenticates user with <u>Use Case – Authenticate User</u> 3. JumpPad tool places the user into a blank network plan (sort of like being in Document1 when you open Word.) 4. User does <i>any</i> of the following (in any order) until the plan is complete or ready to be saved : <ul style="list-style-type: none"> • User defines topology objects – <u>#Use Case – Define Topology Objects</u> • User defines & configures devices – <u>#Use Case – Define & Configure Devices</u> • User imports a .dxf file and defines topology objects from it – <u>#Use Case – Import .dxf File</u> • User imports an HP OV device list and defines devices from it – <u>#Use Case – Import HP OV Device Discovery</u> • User can import data from a device - <u>#Import from Device</u>. 5. User saves the network plan. 6. The JumpPad puts the plan into a persistent store or disk.
Exceptions	
Alternate Flows	<ol style="list-style-type: none"> 3a. User opens an existing network plan. <ol style="list-style-type: none"> 1. Proceed to <u>Use Case – Work On A Saved Network Plan</u>
Issues & Notes	<ul style="list-style-type: none"> • Not too sure about the Word model. It could be irritating to always start with a blank document – but this could of-course be a user configurable. Will users be constantly switching between a large set of models/files, or will they typically only use one. • Do we need to version the files? With a FS the user can simply rename.

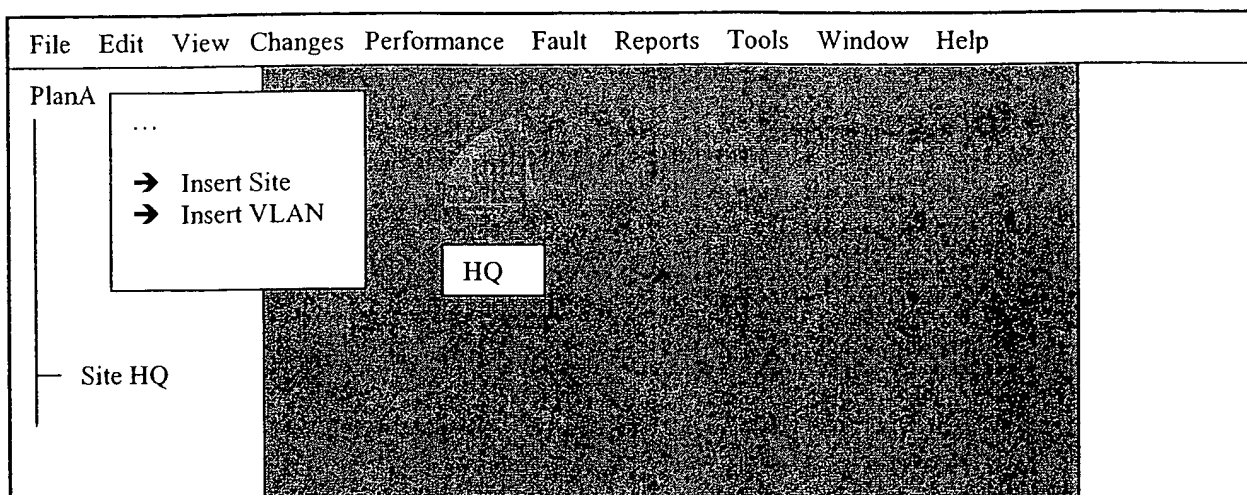
3.1.2 DEFINING TOPOLOGY OBJECTS

Pre-conditions	User is working on a network plan and wants to define/modify the topological view of the plan.
Post-conditions	User has successfully defined/modified the network topology.
Main-Flow	<ol style="list-style-type: none"> 1. User selects any one of the following objects (from a menu or palette): <ol style="list-style-type: none"> a. Site b. Building c. Floor d. Walls 2. User places object on the drawing area. 3. User configures the attributes of each object: name, location (co-ordinates?), dimensions, any obstruction characteristics (e.g. a thick wall), etc. 4. User repeats steps 1-3 till the topology is defined as needed. 5. User can associate the topology with devices as described in <u>#Use Case – Define & Configure Devices</u>
Exceptions	
Alternate Flows	
Issues & Notes	

The user makes use of the Organizer Panel (or Menu Bar) and the Context Editor to add topological objects to the plan. By right-clicking on an element in the Organizer Panel, the user can insert a new element. The same operation can also be done by using the following option from the Menu Bar:

MENU: Edit -> Insert

Based on the element selected, a different list of devices will be shown for insertion.

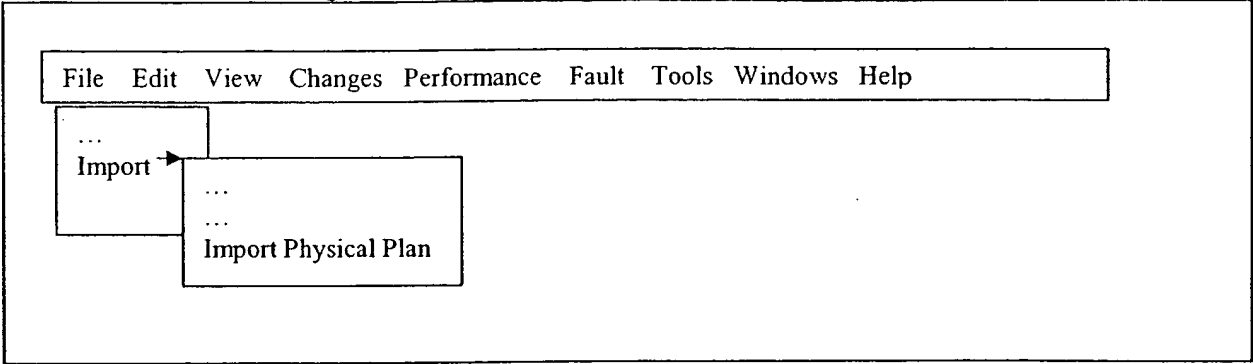


3.1.3 DEFINING PHYSICAL PLANS

Pre-conditions	User has started a new network model, or working on an existing model.
Post-conditions	User has imported plan information (e.g. from a .dxf file) into a network model.
Main-Flow	<ol style="list-style-type: none"> 1. User selects option to load a .dxf file (or other network model file.) 2. JumpPad prompts user for file name/path. 3. JumpPad opens file, and reads the data from it. 4. The User instructs the JumpPad to associate a .dxf with a topological object (is it only a floor?), or to create a new topology object for the .dxf file. 5. When selected, JumpPad displays the .dxf file as a background to the topology object. 6. User would typically continue to either: <ul style="list-style-type: none"> • <u>#Use Case – Define Topology Objects</u> • <u>#Use Case – Define & Configure Devices</u>
Exceptions	<ol style="list-style-type: none"> 4a. The topological object already has an associated .dxf file. <ol style="list-style-type: none"> 1. JumpPad replaces existing file with new one (after a warning?)
Alternate Flows	
Issues & Notes	<ul style="list-style-type: none"> • Is the .dxf more of a drawing/background, or does it give us more information like the list of objects and their co-ordinates? If so, then the user can be shown this list and asked to map them to topological elements.

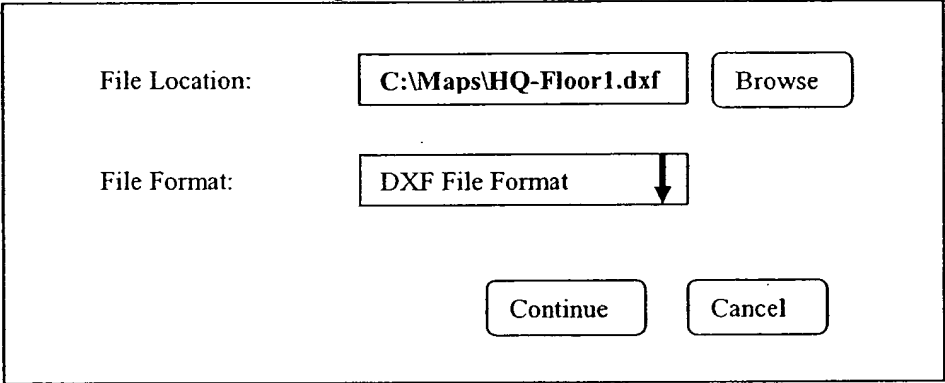
The MENU: File -> Edit -> Import option will allow the user to import a physical model.

Figure 2: Import Physical Plan Menu



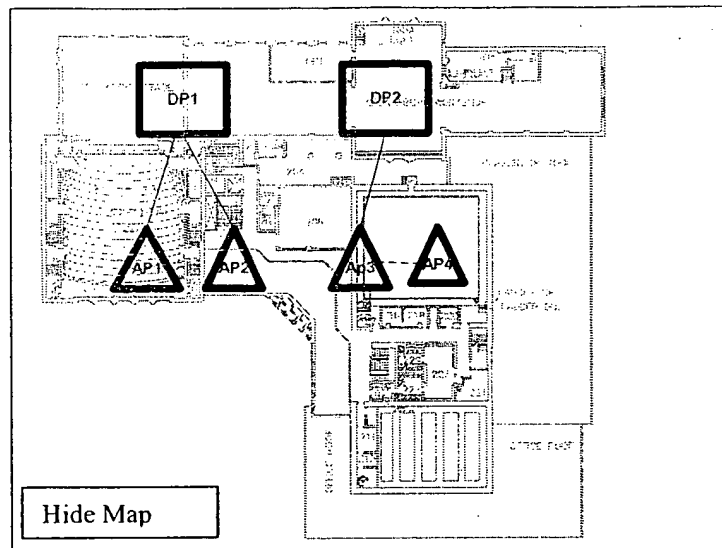
This will open a dialogue box which allows the user to enter the file location. The user can invoke the browse function to see browse their directories for a file. When a file is selected, if the file extension is recognized its type will be shown. Otherwise, the type will be listed as “unknown” and the user can manually set it to the desired type.

Figure 3: Import File Dialogue Box



After the topological file has been imported, and the topology objects are defined, the user can start associating network devices with various topology objects.

Figure 4: Topological Display in Context Panel



3.1.4 DEFINING & CONFIGURING DEVICES

Pre-conditions	User is working on a new or existing network model and wishes to define devices in it.
Post-conditions	User has defined one or more devices.
Main-Flow	<ol style="list-style-type: none"> User adds a DP to the network plan by selecting a UI menu option. <ul style="list-style-type: none"> The DP can be added under a topological element (in a topology view) or directly under the plan in a logical view. If the DP is added under a topological element, it automatically uses that element to fill-in its location attributes. If the DP is added under a plan, its location attributes are empty. These can be manually filled in, or the DP can be later associated with a topological element. User defines an IP address for the DP. The User selects a software image version for the DP. Along with the software image a default configuration will be associated with the DP. User fills-in the rest of the required configuration data (what is this?) for the DP. Optionally, the user manually adds location information for the DP, or associates the AP with a topology object. Optionally, the user instructs the JumpPad to load a default/template configuration for the DP. The choices for this may be based on the software version of the DP. User plans AP deployment: <ol style="list-style-type: none"> User graphically selects a desired coverage area that includes one or more DPs. The user then supplies the bandwidth, etc (what is the precise list?) for

	<p>the coverage area.</p> <ul style="list-style-type: none"> c. JumpPad will generate an ideal coverage configuration, and show where APs should be placed. d. User can move the APs around and check coverage attributes. <p>8. User configures one or more APs on the DP.</p> <ul style="list-style-type: none"> a. User instructs the JumpPad to load a default/template configuration for the AP. b. User fills in other required configuration information. <p>9. User repeats the above steps until the network model devices are configured as needed.</p> <p>10. User can choose to “deploy” or “manage” the device as described in REF.</p>
Exceptions	
Alternate Flows	<p>7-8a. User manually defines AP location:</p> <ul style="list-style-type: none"> 1. User points to an area and instructs JumpPad tool to locate an AP there. 2. User enters in location information. 3. Continue with 11 in the main-flow.
Issues & Notes	<ul style="list-style-type: none"> • Do we need a default/template configuration file? Is there a choice or is it preset by the software release? • As the devices are being built, the logical GUI pane can simply show a containment tree of DPs and APs. If the user prefers a topological view, devices can be shown underneath buildings/floors, etc.

When the User adds a new DP, a DP creation box will be used to enter in the DPs information. At this point, the User can choose to import data from the DP (assuming it is already deployed) or can choose to continue to select a software version, and enter in any necessary configuration data.

Figure 5: DP Creation

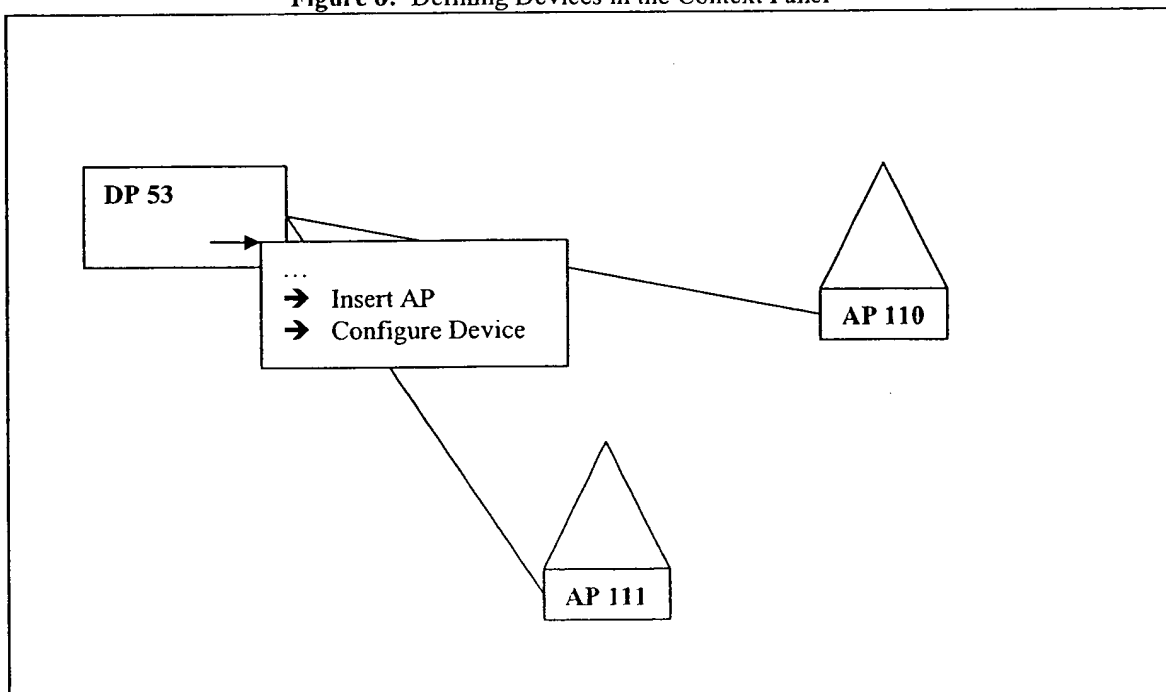
Name:

IP:

Software:

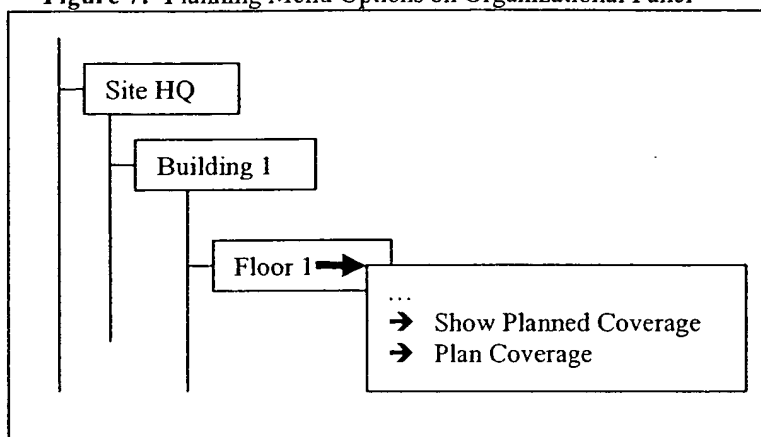
Management State: ☐ Managed ☒ UnManaged

The user is able to add devices from either the Organizational Panel or the Context Panel. The user can move around (drag and drop) the objects in the Context Panel. If the user has either defined a topology, the location attributes of the object will be updated. Alternatively, the user can manually update the location attributes, and the device will be automatically moved.

Figure 6: Defining Devices in the Context Panel

To validate the coverage, the User must select a coverage area. This could be an existing topology object (the user selects the object and then selects a menu option from it), or could be a coverage area that the User manually draws. The User can then select an option to run show the current coverage on the selected area or topology object. Using the supplied configuration data, JumpPad will display a coverage map. The user can then tweak the shown configuration as needed. If desired the user can save the changed configuration.

Figure 7: Planning Menu Options on Organizational Panel



By selecting a topology object or pre-defined coverage area, the user can also select an option to run a planning algorithm. In this case the user supplies the desired coverage requirements (e.g. desired bandwidth), and lets the application suggest a configuration. The user can tweak the configuration as needed, and save the configuration changes.

Note that to actually apply the changed configuration to the network the user must use the normal deployment procedures (described in a later section.)

Figure 8: Planning Window

Current Coverage:

89%
5.5 Mbps

Desired Coverage:

100%
7 Mbps

Generate Plan

AP 110

AP 111

→ Edit Parameters

Recalculat

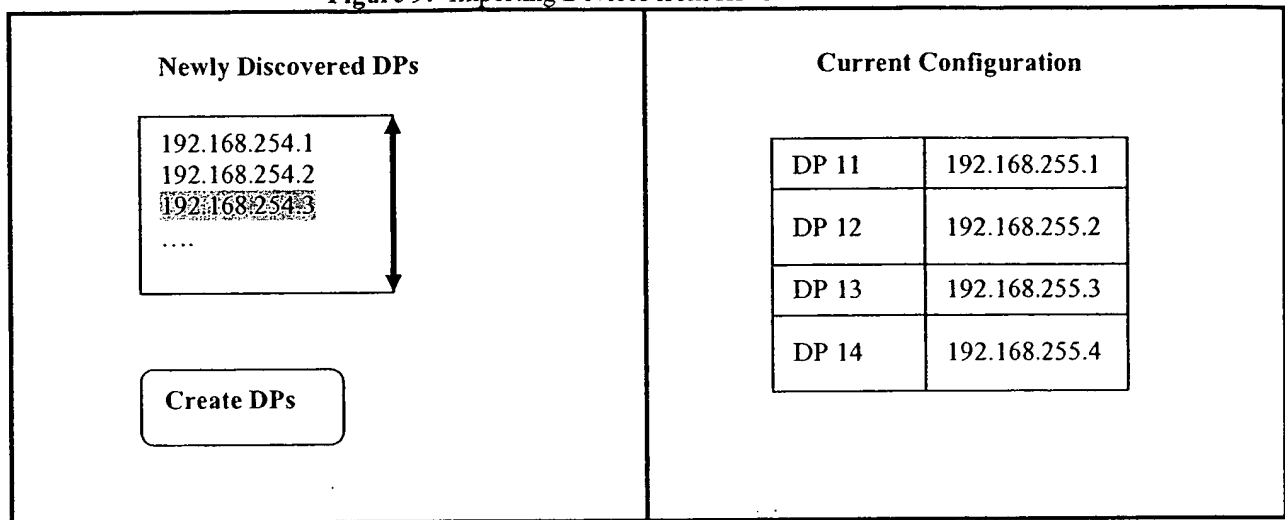
Save

Cancel

3.1.5 IMPORTING HP OV DEVICE DISCOVERY

Pre-conditions	User is working on a new or existing network plan. The user has previously configured the JumpPad to cooperate with an HP OV installation.
Post-conditions	User has imported devices discovery data from HP OV, and has associated devices with it,
Main-Flow	<div><div>1. The user selects a menu that lists possible HP OV interactions and choose an “import devices” function.</div><div>2. JumpPad queries the HP OV installation, and collects a list of DPs and IP addresses.</div><div>3. JumpPad shows this list to the user.</div><div>4. JumpPad will also display the current configuration of the plan.</div><div>5. The Use can create a new DP from a discovered IP address. The user will then be prompted to configure the device, or to import configuration from the device.</div></div>

Exceptions	
Alternate Flows	
Issues & Notes	<ul style="list-style-type: none"> Need an easy way to batch-create DPs from a set of IP addresses.

Figure 9: Importing Devices from HP OV

3.1.6 WORKING ON A SAVED NETWORK PLAN

Pre-conditions	A user has previously worked on and saved a network plan. The plan can be in any state i.e. it may or may not have been used to manage a network.
Post-conditions	User has opened and is using a previously saved plan.
Main-Flow	<ol style="list-style-type: none"> 1. User asks JumpPad to load an existing network plan. 2. JumpPad prompts user for path/name. This will be one logical name, and not a whole list. 3. JumpPad closes the current plan (if one is open), and starts loading the new plan. 4. The loading includes opening all files (including maps etc.) associated with the plan. 5. User typically starts work on modifying/extending the plan, or simply uses it to start managing devices.
Exceptions	
Alternate Flows	
Issues & Notes	

4 DEPLOY

Once the user has built the plan, and performed certain rules verification of the plan, he is ready to deploy the plan and make the configuration changes to the network. There are still two preliminary steps to perform before the user can start the deployment.

- 1) Physical Device Setup: this will provide the minimum IP connectivity to the DPs and APs
- 2) Specify software image version for the DP and APs.
- 3) User hits "Deploy" to deploy the network plan to the device.
 - a. JumpPad will run a list of Verification Rules based on the configuration change sets.
 - b. JumpPad Push the configuration and images to the device.

4.1 PHYSICAL DEVICE SETUP

Before JumpPad can deploy the network plan created in the previous section the network manager must perform the following steps to enable basic IP connectivity to the network devices.

4.1.1 DP SETUP

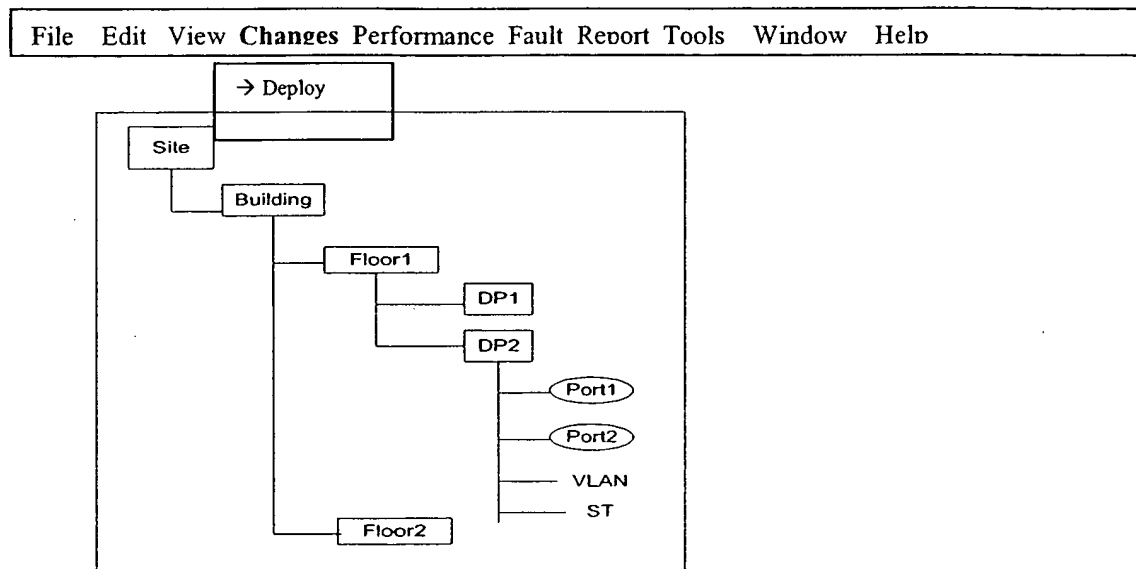
- At the console, the user configures the IP address and default route
 - a. Future will be to get this automatically via DHCP
 - b. Assumptions:
 - i. Has default image for APs on the file system
 - ii. By default the switch is secure (i.e. doesn't pass any traffic)
 - iii. By default it is a flat bridge
- DNS parameters may need to be configured
- Either via Telnet or at the console the user configures:
 - a. SID
 - b. Certificate Authority certificate(s)
 - c. Authentication Methods
 - i. Local/RADIUS/TACACS+ setup

4.1.2 AP SETUP

- ZERO config required.
- Downloads image from DP on boot up.

4.2 DEPLOY CHANGES TO NETWORK

Once the network has basic connectivity JumpPad can distribute the configurations and images constructed as part of the planning process.



By clicking on the "Deploy" option, a "Deploy" wizard will be launched as the following UI.

4.2.1 REVIEW DEVICE CHANGES BEFORE DEPLOYMENT

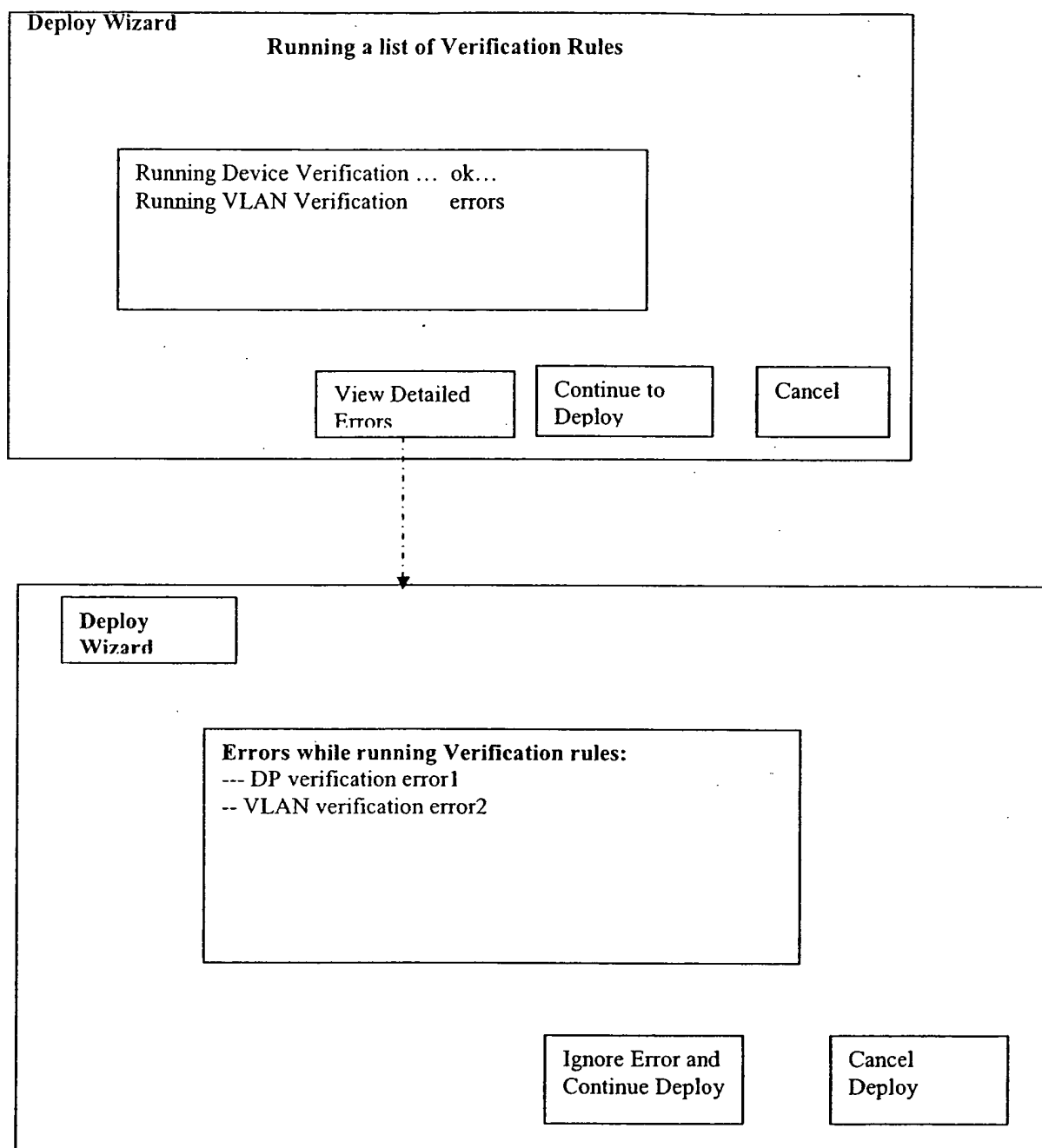
Once the user has hit "Deploy", JumpPad will display a list of changes the user has applied to the network, and asks the user if he wants to proceed. The user reviews the changes, and if there are any corrections or further changes that need to be done, he can cancel the deployment and go back the configuration changes again, and hits "Deploy" later on. The following is the UI for showing the list of configuration changes:

Deploy Wizard	
Network Config Change Summary	
Device Name	Configuration Change Set
DP1	Change1 Change2
DP2	
DP3	

Deploy Now Cancel

4.2.2 DEPLOY CONFIGURATION CHANGES

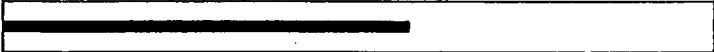
Pre-conditions	User has built a network plan that consists of one or more devices. The devices have been physically installed and are in managed state.
Post-conditions	The devices are deployed and active.
Main-Flow	<ol style="list-style-type: none"> 1) User selects a network plan, chooses “Changes” menu and select “deploy” submenu. JumpPad will bring up a Deploy wizard and display a list of the changes summary currently outstanding in the network plan. 2) If the user chooses to say “Deploy Now”, JumpPad will bring up the next Verification dialog. 3) JumpPad will run verification rules on any changes to ensure no errors occur. Need to show dialog showing this running. If errors discovered the user has to manually select to continue (i.e. override) or cancel the deploy action. 4) If user chooses to continue Deploy. JumpPad will start making the deployment changes to the devices. For each device in the network, JumpPad does the following: <ol style="list-style-type: none"> a. JumpPad will check if the device is in <i>Managed State</i>, <ol style="list-style-type: none"> i. If the “sync” state is “true”, JumpPad will apply the configuration change and/or images set to the device ii. If the “sync” state is “false”, JumpPad will first get the configuration changes from the device, and then apply the config change set on top, and then send the config changes to the device. b. Else if the device is in <i>Unmanaged State</i> <ol style="list-style-type: none"> i. JumpPad will only apply the change to the local cache and db copy. 5) JumpPad display a dialog for all devices being deployed to and the progress for each device. 6) If there are any error messages that coming back from the device, user will be able to view the error status and take appropriate actions such as Rollback (revert).
Exceptions	
Alternate Flows	
Issues	



If the user clicks on View Detailed Errors, the above UI screen will be displayed. Users has a choice of ignoring all the errors, and continue to deploy; Or user can cancel Deploy now. User can go back to make the modification of the configuration changes, and then later hit "Deploy" again to rerun the Deploy wizard.

4.2.3 DEPLOY ERROR HANDLING AND ROLLBACK

Once the user has hit the deploy action after the verifications, the following dialog will show up to show the progress of the deployment. Once a deployment is in progress, user can not cancel the action in the middle.

Plan1 Deploy Progress bar	
Deployment is in progress for Plan1	
	
80% complete...	<<Details>>

If there is any errors occur in the deployment, user can select Details and he will be able to view the error status and details for the deployed devices. The following UI will be launched if the user clicks on "Details":

Plan 1 Deploy Status		
Device Name	State	Status/Msg
DP1	Unmanaged	Skipping..
DP2	Managed	Success
DP3	Managed	Failed
Revert Back All Changes?		Close

JumpPad will allow the user to revert back "ALL" the configuration changes. If the user chooses to "Revert back", JumpPad will use the previous saved configurations (last saved) for all devices and apply that to the device again.

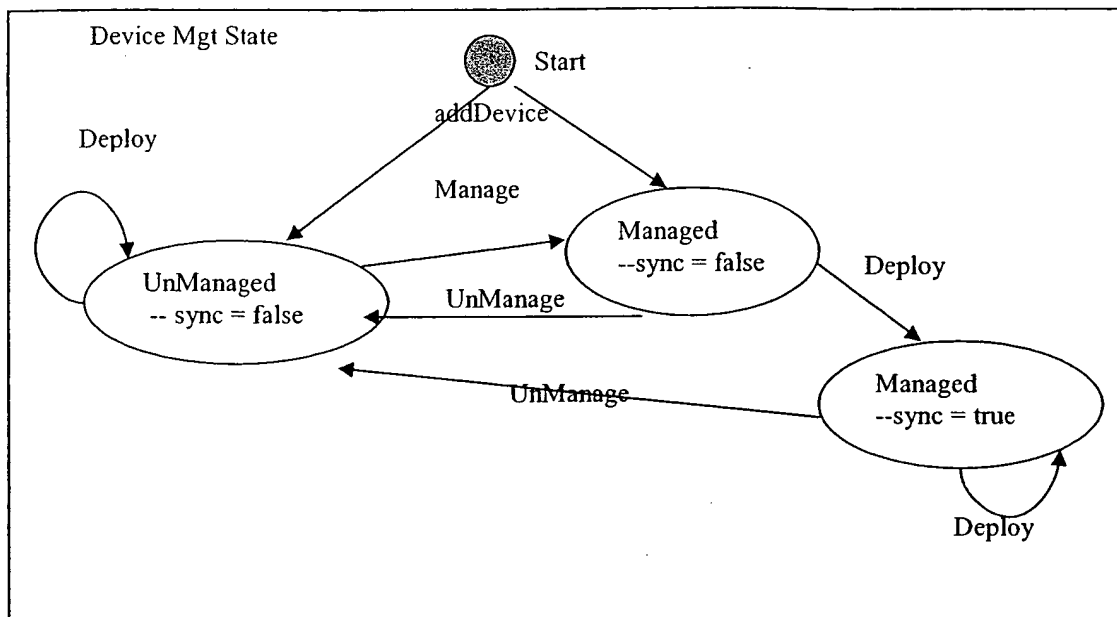
Pre-conditions	User has done deployment for one or more devices in the network and there are errors during the deployment.
Post-conditions	Error conditions are handled and the devices configurations are reverted if the user chooses to.
Main-Flow	<ol style="list-style-type: none"> After the user has hit "Deploy", there will be a progress dialog that comes up and display the progress of the deployment. User can not cancel the Deploy action in the middle but can view the status of the

	<p>deployment and possibly errors that occurred.</p> <ol style="list-style-type: none"> 3. User clicks on “Details” button, a list view of all the devices that are deployed and their status. 4. If there are any failure during deployment: <ol style="list-style-type: none"> a. User can choose to say “Revert Changes” and JumpPad will prompt the user “Are you sure you want to revert back ALL the configuration changes? If the user says “yes”, JumpPad will revert back the all the changes that have applied to the device. JumpPad will use the last saved configuration, and send that down to the device. b. If the user did not choose “Revert Changes”, JumpPad should save all the changes of the device (change failed) <ol style="list-style-type: none"> 1. User can go back and fix the device problem, 2. User goes to JumpPad to perform “deploy” again. JumpPad will send down the Config changes to the device again.
Exceptions	
Alternate Flows	
Issues	

4.2.4 DEVICE MANAGEMENT STATE DIAGRAM

JumpPad has the notion of the “Managed” and “Unmanaged” state. It is an attribute of the managed device. This is an administrative state that user decide whether he would like to manage the device or not. If the devices are in unmanaged state, even if the user hits “Deploy”, NMS will not send down the configuration changes to the device. If the device is in “Managed State”, JumpPad will compute all the change set that the user has made so far, and apply that to the device. JumpPad application will have another separate flag called “Sync” state in each device in order to manage whether to connecting to the device when first deployed or not. If the device is in “Sync” state, that mean the device has been synchronized before and when we do the deploy, JumpPad will sync up all the device configuration from the DP first, and then send down the device config change set to the device. If the device in “sync = false” state, that means the device has not been synchronized before, JumpPad will send down the entire configuration that the user has built to the device.

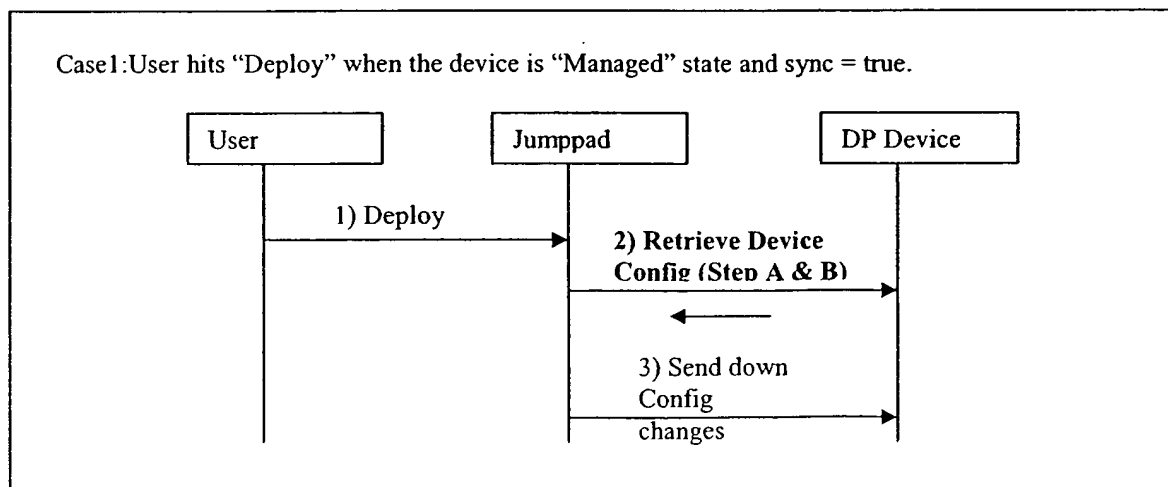
The following is the state diagram of the Device State:



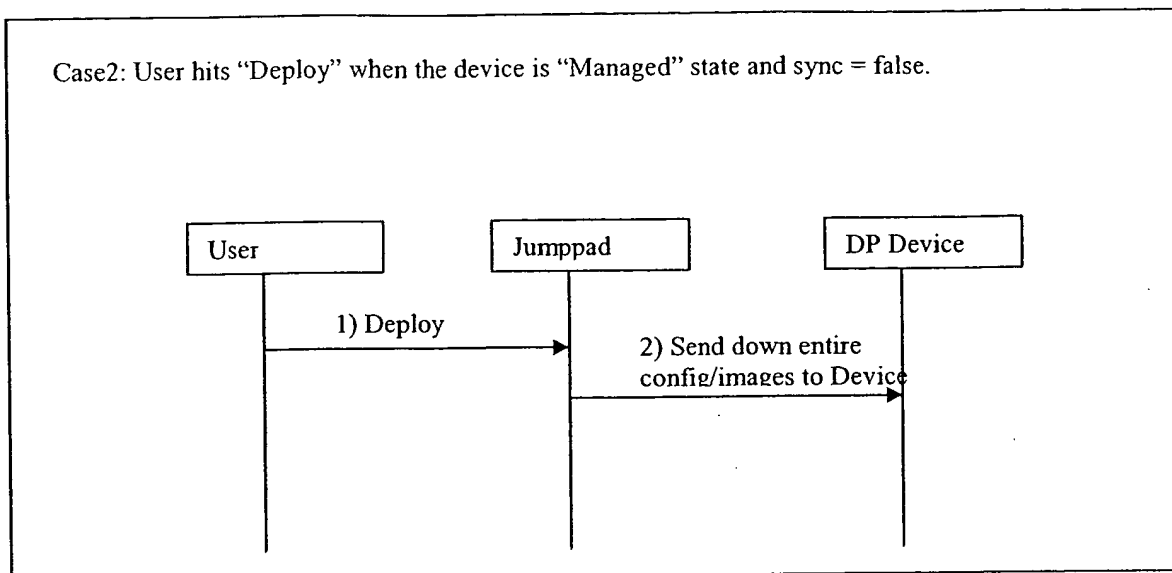
Case 1: A device is in a Managed state (with sync state = true), and the user has chosen to Deploy the network. JumpPad will first retrieve the device config, and then send down the configuration change set to the DP device.

In Step 2), when JumpPad retrieves the device config, if there are no configuration changes (from event log file from DP device), JumpPad will perform no operations.

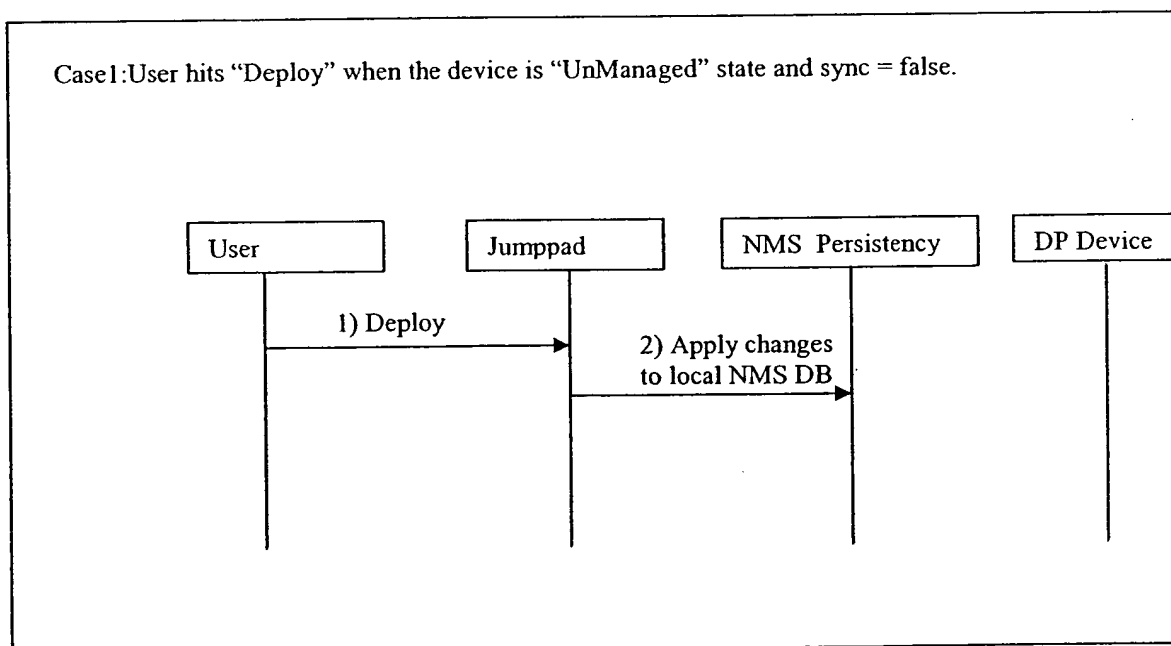
If there are configuration changes, JumpPad will probably retrieve the whole configurations from the device, re-apply them to the current configuration and change set, and re-run the verification step. If there are any errors at this point, JumpPad will prompt the user again.



Case 2: A device is in a Managed state (with sync state = false), and the user has chosen to Deploy the network. JumpPad will send down the entire configuration change and/ or images directly to the DP device

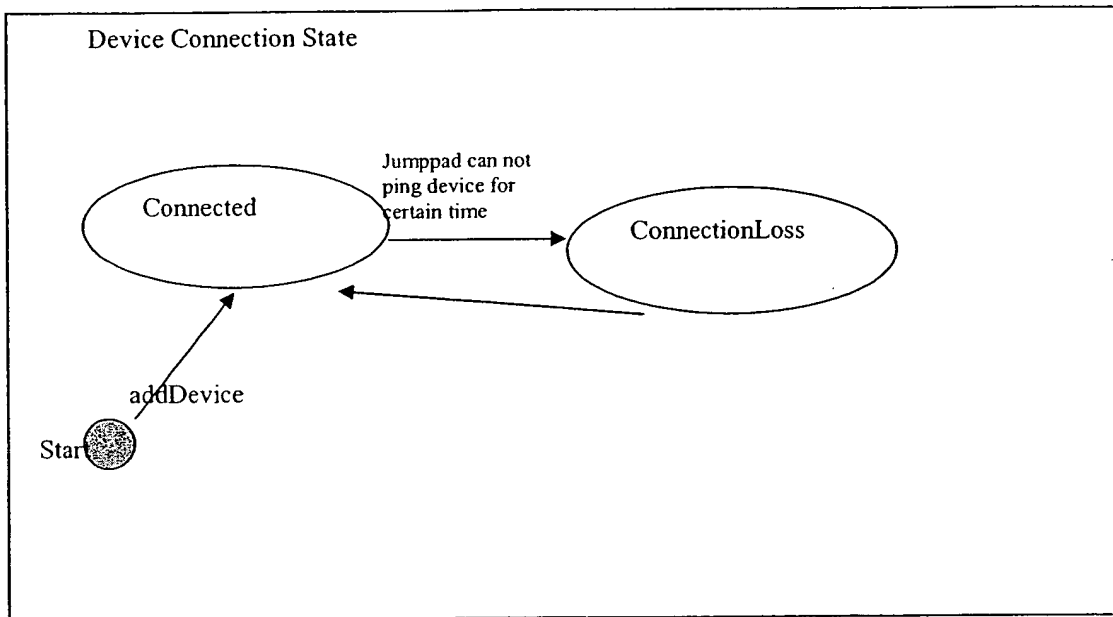


Case 3: A device is in an Unmanaged state (sync state = false), and the user has chosen to Deploy the network. JumpPad will only apply the configuration change locally at NMS level.



4.2.4.1 DEVICE CONNECTION STATE

JumpPad will also keep a copy of the Device Connection State which keeps track of whether JumpPad can connect to the device or not.



JumpPad will have some kind of TCP connection to the device that is up and running all the time. JumpPad will be listener and register for the call back of the "Keep Alive" function. (There is some timeout mechanism to detect the connection loss). JumpPad will get notified if the connection is lost and take certain action such as coloring the Device to "red" to indicate the connection to the device is lost.

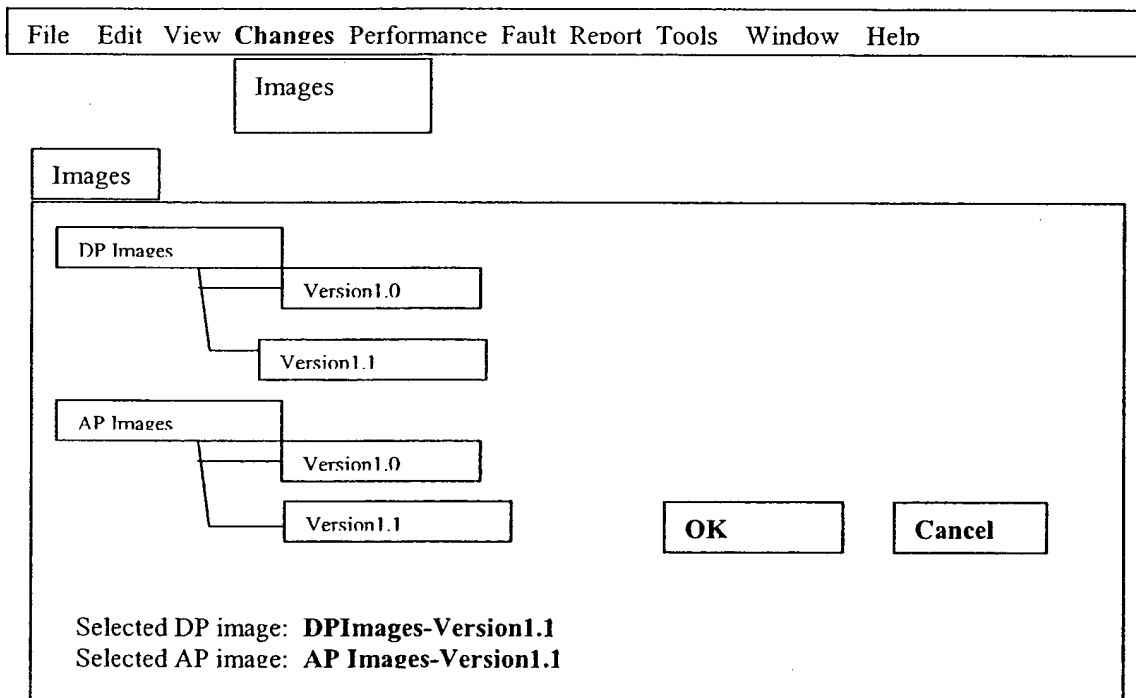
4.2.5 SAVE SNAPSHOT VERSION OF THE CONFIGURATION

Just a note that we need to have a place to invoke to save the "SNAPSHOT" of the network plan and in case the deployment of the configuration totally disabled the device, and needs to use last Saved SNAPSHOT to revert back to the previous state.

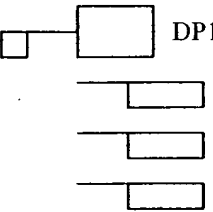
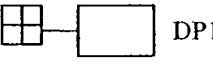
4.3 IMAGE DOWNLOAD AND UPGRADE

NMS product will deploy new images in the normal management path as other changes. To upgrade the images for a set of DP/APs, JumpPad will provide a Bulk-Upgrade tool to easily upgrade all the DPs and APs in the network. The following steps will be performed:

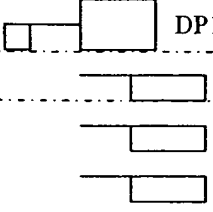

1. User will select a list of images for the AP and DP. There is a default image for AP and DP images for ease of use if the user did not select the images.
2. User will select a list of devices (for upgrade scenario) for the image upgrade to take place. By default, all the devices in the network will be upgraded to the selected images as mentioned in step1.
3. JumpPad will send the image to the DP, and save it on the DP disk if DP does not already have the image.
4. JumpPad will send the configuration file that refers to the DP/AP image name and version to DP.
5. DP will reboot itself after the image/config file download complete if user chooses "Reboot Now" option.



Once the user has clicked on "Ok", JumpPad will be able to go to the devices in the network and query all the existing image versions of the devices, and launch the next UI screen:

Image Upgrade			
New DP Version:		DPVer1.1.image1	New AP Version: APVer1.1.image1
Device List			
	Devices	Current Image Version	Status
X		DPVer1.0Image1 APVer1.0Image1 APVer1.1Image1 APVer1.0Image1	
X		DPVer1.0Image1	
			<input type="button" value="Next"/> <input type="button" value="Cancel"/>

User can select the "Next" option if he chooses to and JumpPad will launch the next Reboot screen to let the user choose whether the devices will be rebooted after the image download is complete.

Reboot Option			
New DP Version:		DPVer1.1.image1	New AP Version: APVer1.1.image1
Device List			
	Devices	Current Image Version	Reboot Now Option
X		DPVer1.0Image1 APVer1.0Image1 APVer1.1Image1 APVer1.0Image1	<input type="button" value="Yes"/> <input type="button" value="Yes"/>
X		DPVer1.0Image1	
			<input type="button" value="Upgrade"/> <input type="button" value="Cancel"/>

Pre-conditions	User has built a network plan that consists of one or more devices. The devices have been physically installed.
Post-conditions	The device images are downloaded and upgraded.
Main-Flow	<ol style="list-style-type: none"> 1. User chooses Config-> "images" to select the images view and start selecting which images to upgrade to DP and APs. By default, JumpPad will associate with a default config file and image for the APs. Note that only one set of DP image and AP image can be selected at a time. 2. User clicks on "Ok" once he has selected the image version to upgrade to. 3. JumpPad displays a dialog box to show a list of devices in the network and their current versions of the software images that the DPs and APs are currently running. 4. User selects a list of devices (including DPs and APs) that he would like to upgrade, and clicks on "Upgrade". JumpPad will support "Reboot Now" option to allow device to reboot immediately if the user chooses to. 5. For each DP in the network, JumpPad will perform the following: <ol style="list-style-type: none"> a. JumpPad retrieves the version of each DP first and compares the version with what the user specifies. b. If the versions are different, JumpPad will first download the DP/AP images to the device if they are not yet on the device. c. JumpPad sends the Config XML file that references the image files to the DP. d. If the user has chosen "Reboot Now" option, device will reboot itself with the specified new image file and replace the software images for all the selected APs (followed by reboot also). 6. JumpPad will support a progress bar dialog to show all the DPs that have been upgraded. User can click on status on each DP to review the status.
Exceptions	
Alternate Flows	For first deployment, user only need to select the images before hits "Deploy" and NMs will assume to download all the DPs and APs with the selected version.
Issues	

4.3.1 REBOOT DEVICE WITH NEW IMAGE

If user has chosen the images to download to the device and AP, but not chosen “Reboot Immediately” option, JumpPad allows the user to later on to reboot the APs or devices.

File	Edit	View	Changes	Performance	Fault Report	Tools	Window	Help
------	------	------	----------------	-------------	--------------	-------	--------	------

Images -> Download
Reboot

If user has chosen the Reboot option under Images, the following dialog will be launched to allow the user to select which AP or DP to reboot

Reboot Option

New DP Version: DPVer1.1.image1

New AP Version: APVer1.1.image1

Device List

	Devices	Current Image Version	Reboot Now Option
X	DP1	DPVer1.0Image1	Yes
	AP1	APVer1.0Image1	Yes
	AP2	APVer1.1Image1	
	AP3	APVer1.0Image1	
X	DP1	DPVer1.0Image1	

Upgrade
Cancel

5 VERIFY

Verification (or validation) occurs at different phases. This section covers a more on-demand verification. There is also implicit or syntactic verification when data is being entered or configured. This is not the focus of this section.

[ALLAN: Long term we need to define the verification that will take place for the configuration. For now we should insert a placeholder for each area we will verify in the offline config view:

Device Verification

VLAN Verification

RF Verification

....etc

As we define the rules we can update the spec to includes those rules]

5.1 NETWORK

[ALLAN: Any verification of the network against planned only makes sense if there are no outstanding changes existing in the current view. So if the user invokes either of these functions while changes exist, the application will prompt them to revert changes or discard changes or cancel operation]

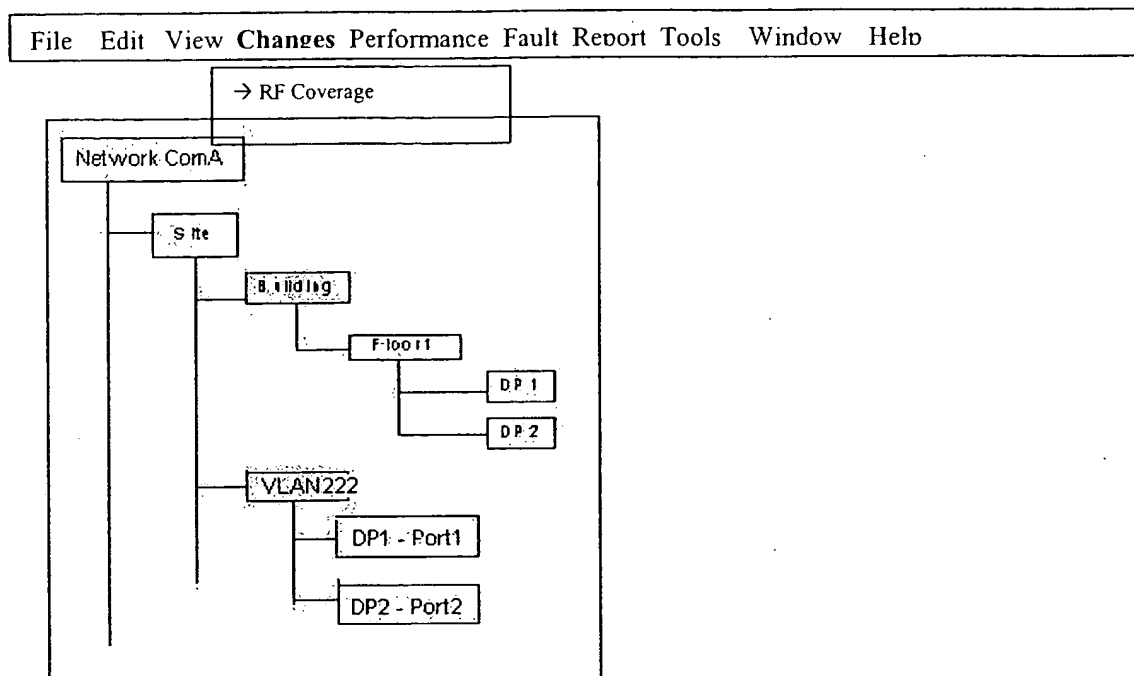
5.1.1 VERIFYING RF COVERAGE

Pre-conditions	A network plan is open.
Post-conditions	RF Coverage is performed on opened network plan.
Main-Flow	<ol style="list-style-type: none"> 1. User chooses from "Changes" Menu to select "RF Coverage" menu item. 2. If the Device is in a Managed and "Sync" states, JumpPad will retrieve actual RF coverage from each device. 3. User can modify the network plan to contain an optimal RF Coverage. 4. User can opt to view the existing RF Coverage on a detailed map.
Exceptions	
Alternate Flows	<p>If the Device is in an Unmanaged state, JumpPad will run a set of verification rules associated with the configuration, and provide an approximation.</p> <p>Repeat Step #3 from the Main-Flow section.</p>
Issues & Notes	Once any modification of the network plan is modified, JumpPad will save its configuration data.

Verifying RF Coverage can be handled from within the “Changes” Menu. A new menu item called “RF Coverage” can be added. In term of RF Coverage, it will be measured in term of the entire Network Plan versus Actual Plan.

RF Coverage attributes (there may be more...)

- Signal Strength
- Hotspots
- Overlaps
- Dead spots

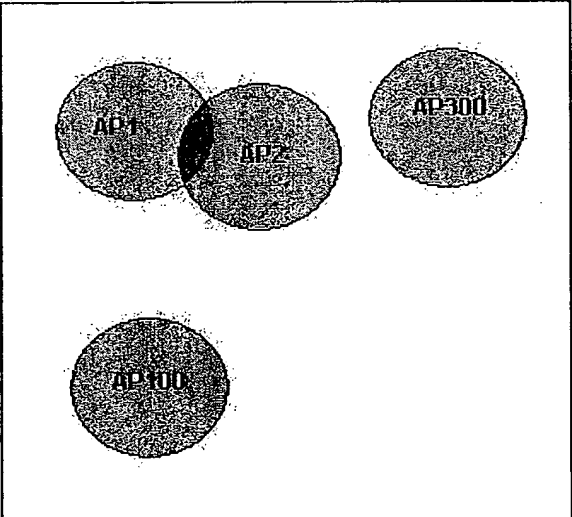


RF Coverage to be viewed on a Site, Building, Floor, VLAN, or DP device basis:

RF Coverage

RF Coverage Area: Site1

DP Selection: Site1.Building2.Floor2.DP1



Current Coverage Area:
65%
5.5 Mbps

RF Property based on DP
Signal Strength: 78%
Hotspots: 3
Overlaps: 1
Deadspots: 3
Power Setting: 200 mW

Proposed Coverage:
100%
10 Mbps

Select "Edit Parameter..." to modify device for optimal usage.

Edit Parameter...
Close

Site1
Site2
Building1
Building2
Floor1
Floor2
DP1
DP2
VLAN100
VLAN200

Any of the RED highlights depict that user should make changes to optimize usage.

5.1.2 VALIDATING PLANNED VS. ACTUAL DEPLOYMENT

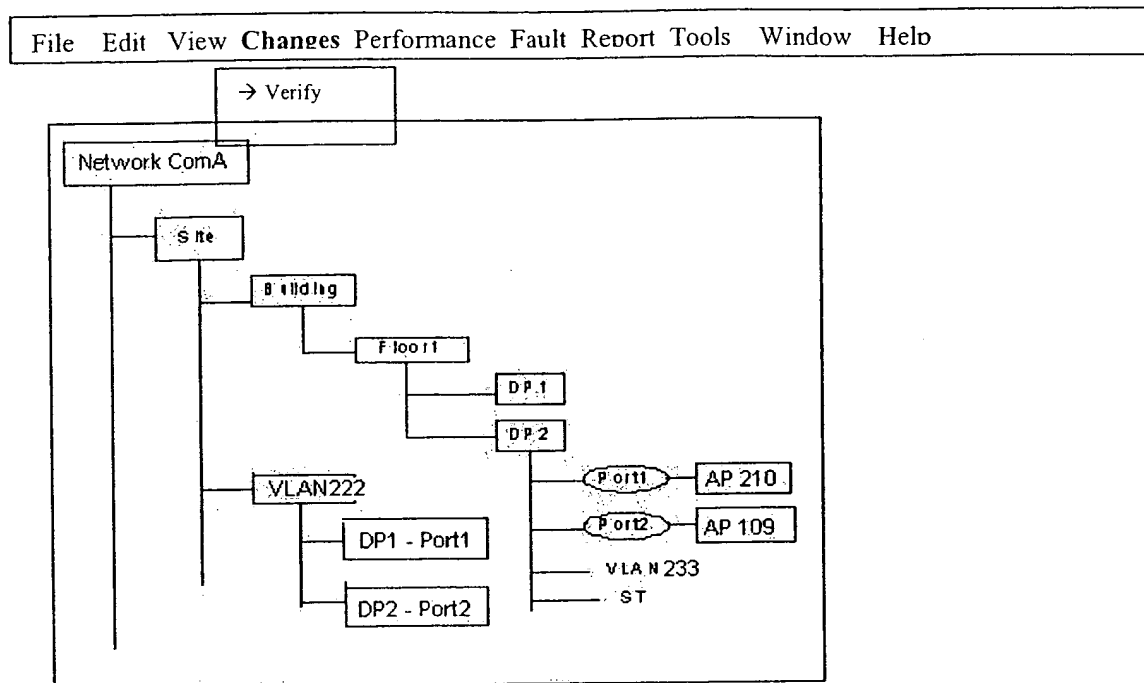
[ALLAN: Need example window and what we will actually check]

5.2 VERIFICATION OF NETWORK CONFIGURATION DATA

5.2.1 VERIFYING CONFIGURATION CHANGES

Pre-conditions	A network plan is open and changes exist in the current view.
Post-conditions	The configuration changes made by the user will be verified for correctness before deployment
Main-Flow	<ol style="list-style-type: none">1. User chooses from "Changes" Menu to select "Verify" menu item.2. JumpPad will run a set of verification rules associated with the configuration, and report a list of error conditions, or miss-configuration information.3. User can go back to the configuration, and correct the configuration, and repeat the step above.
Exceptions	
Alternate Flows	
Issues & Notes	Note that JumpPad will only save the configuration data, not the performance/statistics, fault/event data.

From either Logical or Topological View, user can perform verification against any device or the entire plan.



Case #1: If there is NO Change set on the entire Network Plan.

WARNING:

JumpPad detects that no ChangeSet has been changed.

Do you want to run verification against the entire Network Plan?

Yes

No

All the devices will be verified again. User can cancel the verification process at anytime.

Verification to be performed: Network ComA

	Status
Running Device Verification against: DP1	Success
Running Device Verification against: DP2	Failed
Running VLAN Verification against: VLAN222	Failed
Running VLAN Verification against: VLAN233	Success

Verify **Cancel** **Details >>>**

Verification Summary

DP1: ok
DP2: failed; mis-configuration of data
VLAN222: failed; VLAN no longer exists
VLAN233: ok

<< Back **Ignore** **Edit** **Finish**

Case #2: If there are some Change set on the Network Plan.

Verification to be performed: Network ComA	
	Status
Running Device Verification against: DP1	Success
Running VLAN Verification against: VLAN222	Failed

Only the Devices with Change Set are verified; others will be skipped. User can cancel the verification process at anytime.

Verification Summary
<div style="border: 1px solid black; padding: 10px; margin: 10px 0;">DP1: ok VLAN222: failed; VLAN no longer exists</div>
<input type="button" value="Back"/> <input type="button" value="Ignore"/> <input type="button" value="Edit"/> <input type="button" value="Finish"/>

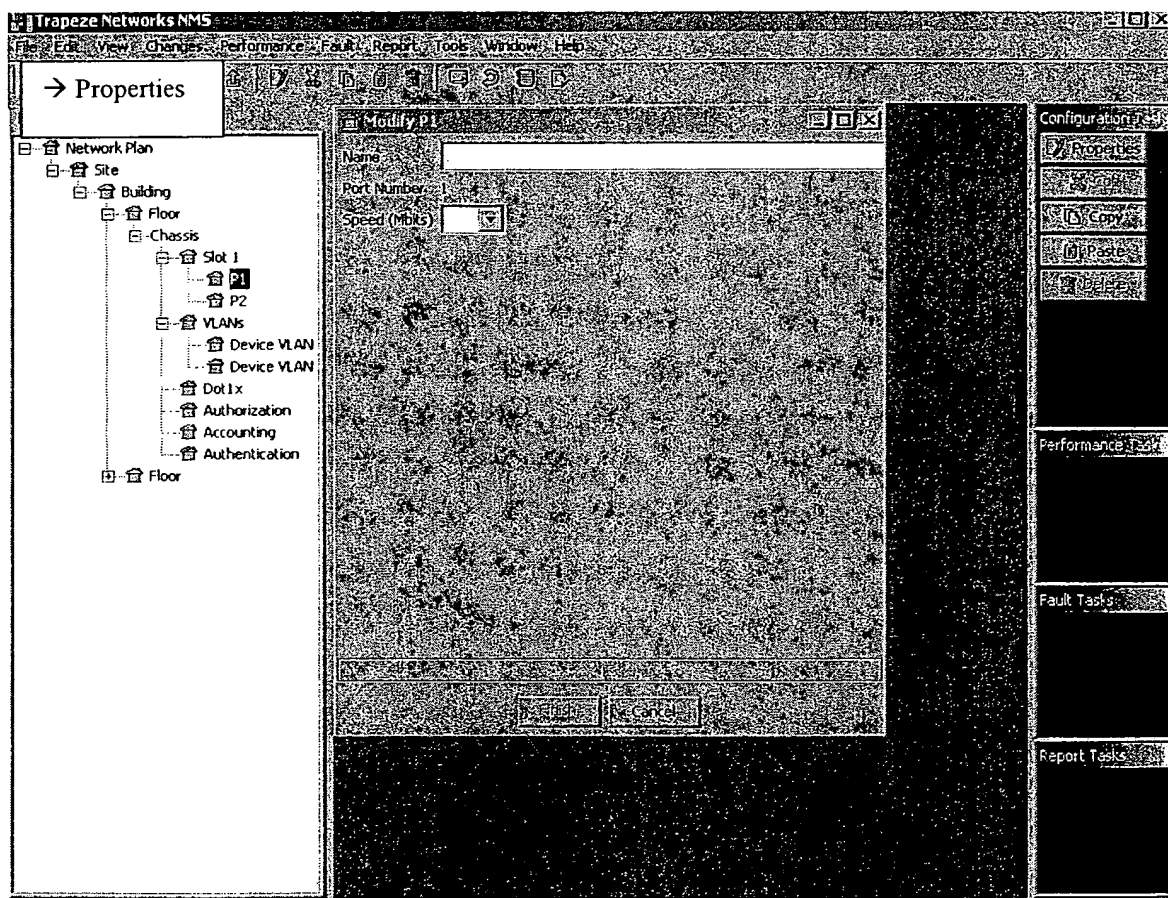
Once verification is performed, JumpPad will save the configuration data as well as any modification when the "Finish" button is pressed.

6 OPERATE

During the normal operation of a network a manager will makes changes to the network configuration and images do performance analysis and check for faults. The following sections outline some of the operational tasks the application will provide.

6.1 NETWORK CONFIGURATION SUPPORT

This section will detail all of the configuration elements we will support and how. User can view, or modify the configuration of the device, VLAN, or plan at any time. By selecting a device or entity in the organizer tree, one can select from “Edit”→ “Properties” to launch any menu to view the configurations of the device, port, or any VLAN or Spanning tree entity.



6.1.1 BASIC DEVICE CONFIGURATION SUPPORT

This section will describe the various other basic device config features we will support. Examples:

- SNMP Trap/Community Strings
- Telnet passwords/account/basic account management
- RADIUS/TACACS client

- NTP
- DNS
- Port Configuration

File	Edit	View	Changes	Performance	Fault Report	Tools	Window	Help
------	------	------	---------	-------------	--------------	-------	--------	------

Properties

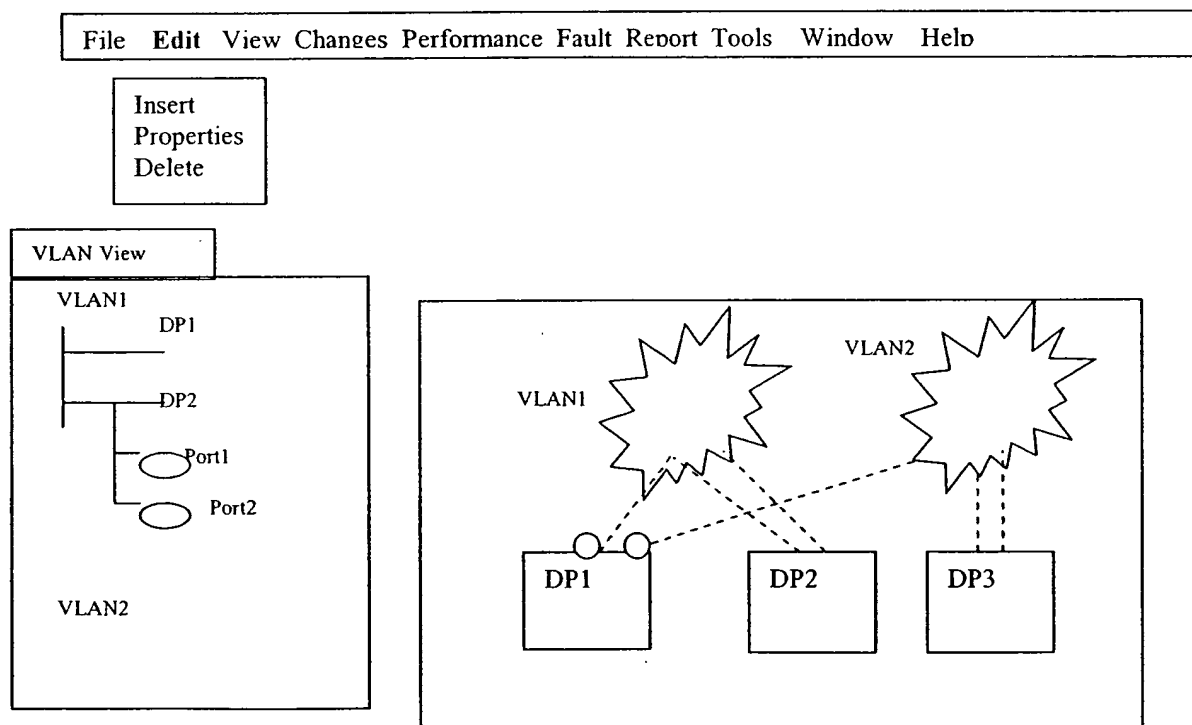
When user clicks on a particular device or port, the user can select “Property” to launch the following dialog to view the configuration of the device or making changes:

DPChassis: 128.10.1.2	
Name:	<input type="text"/>
IPAddr:	<input type="text"/>
NetMask:	<input type="text"/>
NTP:	<input type="text"/>
SNMP Configuration	
Community Name:	<input type="text"/>
Trap Destination:	<input type="text"/>

6.1.2 VLAN SUPPORT

This section will describe what VLAN capabilities we need to configure. The purpose of the VLAN view is to provide an overall network view of the VLAN, and where the DP resides in relative to the VLAN etc. The following functions are defined:

- Create a VLAN
 - Port Members
 - QoS Parameters
 - ACLs
- Modify a VLAN
- Delete a VLAN
- Show a list of VLANs in the map VLAN->DP->Port



6.1.2.1 CREATE A VLAN

File Edit View Changes Performance Fault Report Tools Window Help

Insert ->VLAN

User can go to “Edit”->”Insert->”VLAN” to add a VLAN in the network.

The following parameters that need to be configured when user creates a VLAN:

- VLAN Number (default 1, range: 1-1005)
- VLAN name (“default”)
- VLAN state (active or suspended) (default: active)
- MTU (Maximum transmission unit) (Default 1500, range: 1500-18190)
- SAID (Security Association ID) (Default: 100001)
- Port Group Members

6.1.3 SPANNING TREE SUPPORT

Spanning Tree algorithms provide path redundancy by defining a tree that spans all of the switches in an extended network and prevent the loop hole in the network. JumpPad provides the following capabilities:

- Create a Spanning tree
- Modify a Spanning tree
- Delete a Spanning Tree
- View a Spanning Tree

6.1.3.1 CREATE A SPANNING TREE

File Edit View Changes Performance Fault Report Tools Window Help

Insert ->Spanning Tree

User can go to “Edit”->”Insert->”Spanning Tree” to add a Spanning Tree in the network.

The following is a list of parameters that need to be configured for a spanning tree:

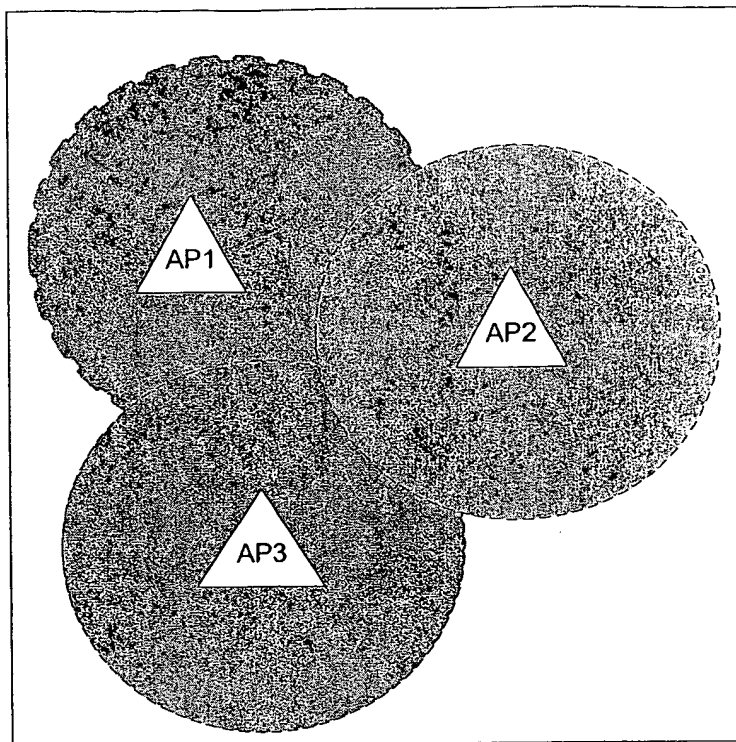
- Spanning Tree ID
- Spanning Tree Type (802.1d or pvst) (default is 802.1d)
- State (enabled or disabled) (default is disabled)

- Forward delay time (default 15 seconds)
- Hello time (default 2 seconds)
- Maximum Aging time
- ?? Bridge priority
- ?? Bridge ID priority
- ?? Port Priority
- ?? Port cost
- ?? Port VLAN priority
- ?? Port VLAN cost

6.1.4 RF SUPPORT

The following features are desired: (See Section 5 for RF Coverage Verification)

- Show the RF topology
 - How do we do Channel Assignments?
 - RF Coverage and bandwidth
 - Detect Interference and rouge APs
- Hotspots
- Overlaps
- Dead spots
- Overlay the RF topology with the physical topology map.
- Allow the user to switch off the AP? Can we support this? I.e. don't disable the port in the DP but switch off the RF capability in the AP. Do we need to do this?
- Configure RF related capabilities for the set of APs
 - As a whole
 - Per Ape
 - Maybe have a set of default AP parameters that if you don't override for an AP it uses the default parameters. That way we can configure "as a whole" by setting the default parameters.



In the above RF Topology map, each color represents different channels and their coverage.

6.1.5 QUALITY OF SERVICE SUPPORT

This section will describe what QoS capabilities we need to configure. How do we provide adequate coverage and roaming across all needed areas, traffic engineering?

6.1.6 ACCESS CONTROL LIST SUPPORT

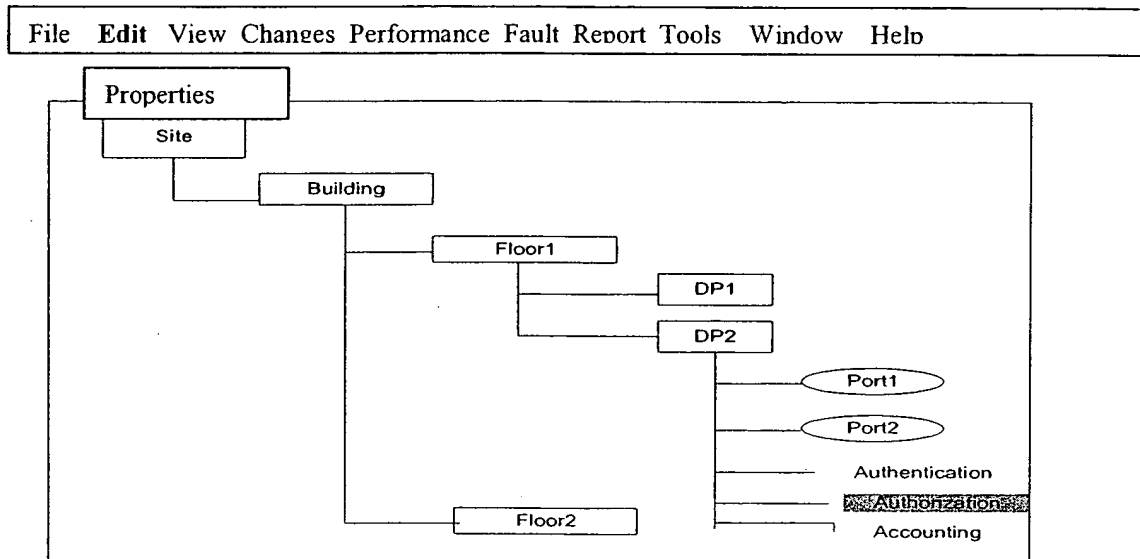
This section describes how NMS handles the ACL (Access Control List) Support and provide necessary configuration support. User should be able to perform the following:

- Enable/disable (global)
- Add an ACL (with ACL index number)
- Remove an ACL (given ACL index number)
- ACL Clauses??
 - Adding a clause
 - Deleting a clause
- Logging ACL activity

6.1.7 AAA SUPPORT

JumpPad will provide necessary AAA (Authentication, Authorization, and Accounting) configurations for security services.

6.1.7.1 AUTHENTICATION CONFIGURATION SUPPORT



For each DP device, user may choose to configure the Authentication security services. The following parameters that need to be configured for Authentication:

- Authentication method (Local, Tacacs, or Radius)
 - Radius Server key, IP Address, port, timeout, retransmit, dead time
 - Or Tacacs Server Key, IP Address, timeout, attempts, directed_requests
- State (enable, or disable)

6.1.7.2 AUTHORIZATION CONFIGURATION SUPPORT

For each DP device, user may choose to configure the Authorization security services. The following parameters that need to be configured for Authentication:

State (enabled, disabled)

6.1.7.3 ACCOUNTING CONFIGURATION SUPPORT

For each DP device, user may choose to view or configure the Accounting services. The following parameters that need to be configured for Accounting:

State (enabled, disabled)

6.2 MANAGED/UNMANAGED OPERATIONAL MODES

For each DP device in a network, JumpPad has the notion of Managed and Unmanaged operation.

1. If the user selects a device and choose to perform “Unmanaged” operation, the JumpPad will stop talking to the selected device, and save the existing configuration to the persistent store. During the “unmanaged” mode, JumpPad will not apply any configuration changes to the device, and only save or retrieve configuration changes to the persistent store (file system in release 1.0).
2. If the user chooses to apply “Managed” operation on an “unmanaged” device, JumpPad will first sync up the configuration data from the device first, and then apply the configuration changes to the device.
3. An “undeployed” device is automatically in an “Unmanaged” mode.

6.2.1 UNMANAGING A DEVICE

Pre-conditions	An active network plan is open and the device are in managed state
Post-conditions	The device is in Unmanaged state
Main-Flow	<ol style="list-style-type: none"> 1. User selects a device from either the organizational panel or context panel. 2. User chooses from “Changes” Menu to select “Unmanaged” menu item, and clicks on ok. 3. An dialog will pop up and says “The device will be going offline if you click ok” 4. If user clicks on ok, JumpPad will save the existing configuration (only config, but not fault/performance data) to the persistent store 5. JumpPad will change the state of the device to “Unmanaged” and will no longer talk to the device. (For example, kills the background thread for talking to the device). 6. A different device icon will be associating with the unmanaged device.
Exceptions	If the device is already in an Unmanaged state, no operation will occur.
Alternate Flows	
Issues & Notes	Note that JumpPad will only save the configuration data, not the performance/statistics, fault/event data.

6.2.2 MANAGING A DEVICE

Pre-conditions	An active network plan is open and the device are in unmanaged state
Post-conditions	The device is in managed state
Main-Flow	<ol style="list-style-type: none"> 1. User selects a device from either the organizational panel or context panel. 2. User chooses from “Changes” Menu to select “Manage” menu item (or by changing the attribute of the device to “Manage”) 3. If user clicks on ok, JumpPad will change the state of the device to “Managed”. Note that “Manage” state does not mean it will goes to the device immediately. When a user hits “Deploy”, then JumpPad will talk to the device. 4. A different device icon will be associating with the unmanaged device.
Exceptions	If the device is already in a managed state, no operation will occur.
Alternate Flows	
Issues & Notes	Do we need to differentiate the device with “Undepolyed”, or “Unmanaged” state? If a device is not yet deployed, can we still apply “Manage” on the device?

How does JumpPad system version the configuration changes? In Release 1.0, JumpPad is using file-based system to store the configuration information. There are two options:

- JumpPad will version each configuration changes after the user has applied the changes to the device only
- Or JumpPad will periodically check-point the configuration, and save that on the persistent store and version that via some timestamp.

6.3 JUMPPAD BACKWARD COMPATIBILITY SUPPORT

JumpPad will provide minimum backward compatibility support for previous versioned DP and AP devices. For example, a JumpPad 2.0 system can provide the minimum monitoring and manageability of DP 1.0 version. If there is any information that JumpPad 2.0 does not understand for DP 1.0, JumpPad will not be able to display or support the functionality.

6.3.1 JUMPPAD SUPPORT OF PREVIOUS DP RELEASE

Pre-conditions	Installed latest JumpPad release and some of the DP in the network are still old release
Post-conditions	JumpPad x.x release manages DP y.y release ($x.x > y.y$)
Main-Flow	<ol style="list-style-type: none">1. User start up new JumpPad system2. JumpPad discovers that some of the DP are old release3. JumpPad will only read the data that it understood currently and discard the data it does not understand.4. JumpPad may only able to manage part of the functionality of the old DP device.
Exceptions	
Alternate Flows	
Issues & Notes	

6.4 JUMPPAD PERSISTENCY

The JumpPad will store the network plans, and all associated data persistently. This includes:

- JumpPad-level topology & device data
- Software Images
- Maps, graphics, etc.
- Device configuration data

It is desirable to not require a database. The open issue is how to support simple schemes for sharing, locking, synchronizations and transactions without a DB.

The persistency is also a means of providing some JumpPad level resiliency. The goal is to leverage the network for as much data as possible, and hence minimize the data that needs to be replicated at the JumpPad level.

The JumpPad installation will create a disk structure as described in the [#Installation](#) section. All plans are stored under the “db” sub-directory. Plans are not associated with users, and are accessible by any authorized user.

The User knows a plan by a given name. Internally, the network plan actually may contain a number of different sub-elements, which could be various types of files, configuration data, and references to software images. All plans share a common software image tree, and hence elements in the plan simply refer to the appropriate software image name. Note that this implies that if a plan is somehow shared between two JumpPad installations, both must have the same software images.

6.4.1 CREATING & OPENING NETWORK PLANS

As described in [#Starting JumpPad](#), when the user can create a new network plan on startup. The user can also access this function via the menu bar.

- Menu Option: File -> New Network Plan... (Accelerator: Ctrl+N, Mnemonic: N)
- Menu Option: File -> Open Network Plan... (Accelerator: Ctrl+O, Mnemonic: O)
- Menu Option: File -> Close Network Plan... (Accelerator: Ctrl+L, Mnemonic: L)

The behavior of opening an existing plan is described in [#Working On A Saved Network Plan](#).

6.4.2 SAVING NETWORK PLANS

Pre-conditions	A plan is opened or has been newly created.
Post-conditions	The plan is saved to a persistent store.
Main-Flow	<ol style="list-style-type: none"> 1. User selects a menu option to save the plan. 2. JumpPad saves all of the current data associated with the plan, including any

	configuration change sets, to the persistent store.
Exceptions	1a. There are no changes associated with the plan: <ol style="list-style-type: none"> 1. JumpPad will disable the "Save" menu option. 2. The user is not able to save the plan.
Alternate Flows	1a. The user invokes the "Save As" menu option: <ol style="list-style-type: none"> 1. JumpPad will prompt the user to enter a name for the plan. 2. JumpPad will attempt to save the plan under the new name. 3. If a plan with the same name already exists, the User will be warned of this condition, and asked if the intent is to replace the existing plan. 4. JumpPad will close the current plan, and open the newly created plan for the user.
Issues & Notes	

The user can access functions to save plans via the menu bar:

- Menu Option: File -> Save Network Plan... (Accelerator: Ctrl+S, Mnemonic: S)
- Menu Option: File -> Save As Network Plan...(Accelerator: <none>, Mnemonic: <none>)

6.4.3 DELETING NETWORK PLANS

Pre-conditions	A plan has been created and saved.
Post-conditions	A plan is deleted from the persistent store.
Main-Flow	<ol style="list-style-type: none"> 1. User selects a menu function to delete a plan. 2. JumpPad lists the existing plans. 3. User selects a plan from the list, and hits a delete button. 4. JumpPad removes the plan and all of its associated data from persistent store.
Exceptions	3a. Plan is in use (either by current user or another user?) <ol style="list-style-type: none"> 1. JumpPad detects that the plan is in use. 2. The delete operation is not allowed.
Alternate Flows	<ul style="list-style-type: none"> • There is an implication that we will have a mechanism to detect that a plan is in use. This implies some sort of locking scheme. Where is this?
Issues & Notes	

The delete function is accessed via the menu bar:

- Menu Option: Edit -> Delete (Accelerator: Ctrl+D, Mnemonic: d)

6.4.4 SHARING NETWORK PLANS

JumpPad does not provide any facility to share plans between machines.

We have discussed the possibility of allowing the user to store the plan on a shared disk. This implies that during install, or as a preference, we should allow the user to point to a different “db” directory.

We may want to consider providing a way to tar/zip a plan, so that it can be manually transferred to a different machine.

6.4.5 AUTOSAVE OF NETWORK PLANS

JumpPad will provide a user preference to enable/disable an Auto save feature. If the feature is enabled the user can specify a time interval. JumpPad will automatically save the plan after the specified interval. This information (that the save is in progress) will be displayed to the user.

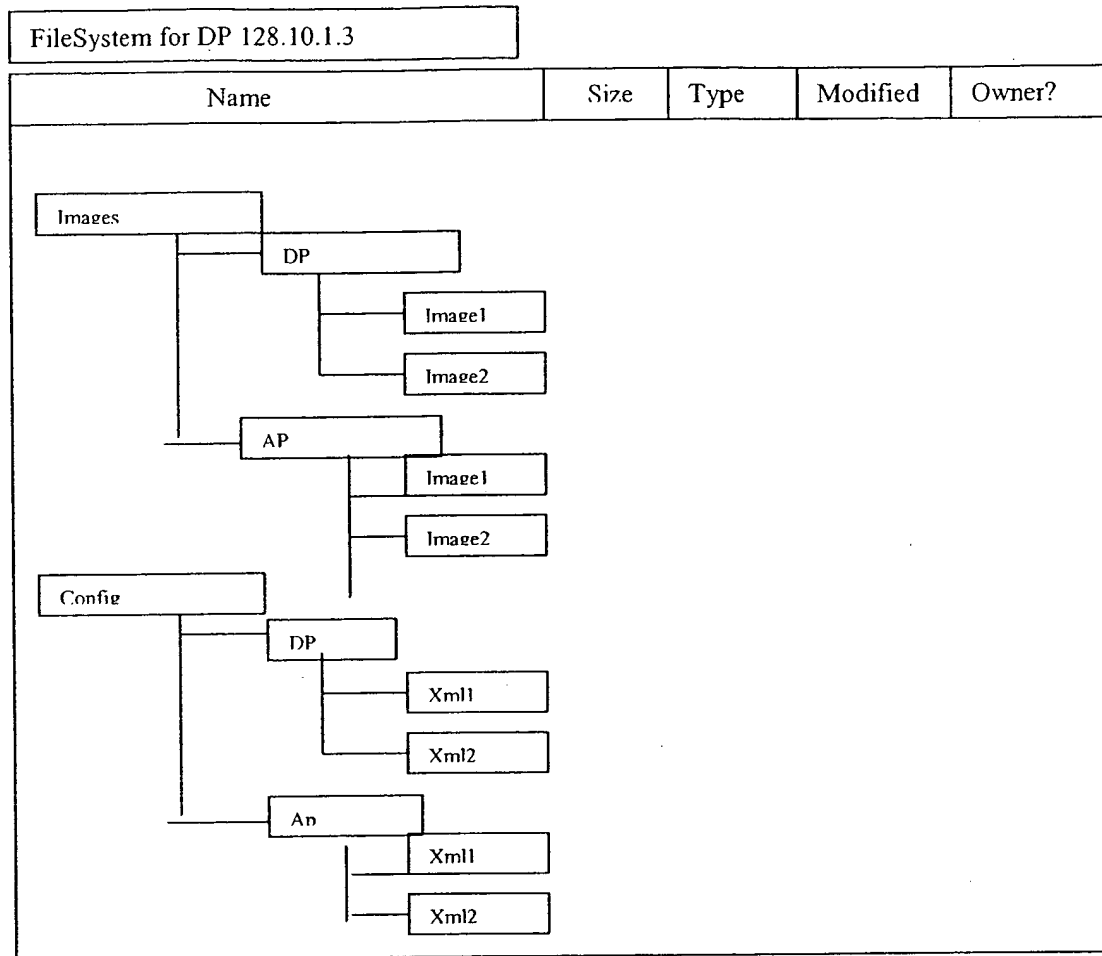
6.5 DEVICE (DP) FILE SYSTEM SUPPORT

The DP will have a file system that supports saving various configuration and image files for both the DP and AP(s).

The management product will support:

- Download of configuration files and image files. The management product will use TFTP to transfer files to the device. This requires the management product to have a TFTP server running and it will instruct the DP to download from the server address a specific file representing the configuration or image file.
- Upload of configuration files. The management product will use TFTP to transfer files from the device. Same method as download.
- File system status. The management product will be able to show the contents of the file system, file sizes, owner (?), and amount of free disk space.
- File system operations. The management product will be able to rename files, delete files, compact the file system (if supported).

All operations will be initiated via the CLI/XML automatically by the management product. The file system status/contents...etc will be read via the XML interface.



User will be able to view the contents of the DP file system, and perform necessary operations on the file system such as renaming a file or delete a file. User can use the standard **Edit->** menu to perform the following operations.

- **Edit Menu**
 - **Insert Menu Item**
 - Insert Menu Item provides the user the ability to add a file
 - **Cut Menu Item**
 - This menu item allows the user to delete a file.
 - **Copy Menu Item**
 - This menu item provides the user the capability to copy a file.
 - **Paste Menu Item**

- This menu item provides the user to paste the copied file to a different location.
- **Rename Menu Item**
 - This menu item provides the user to rename the file to a different name.

6.5.1 MANAGING DP FILE SYSTEM (ADD, DELETE FILES & DIRECTORIES)

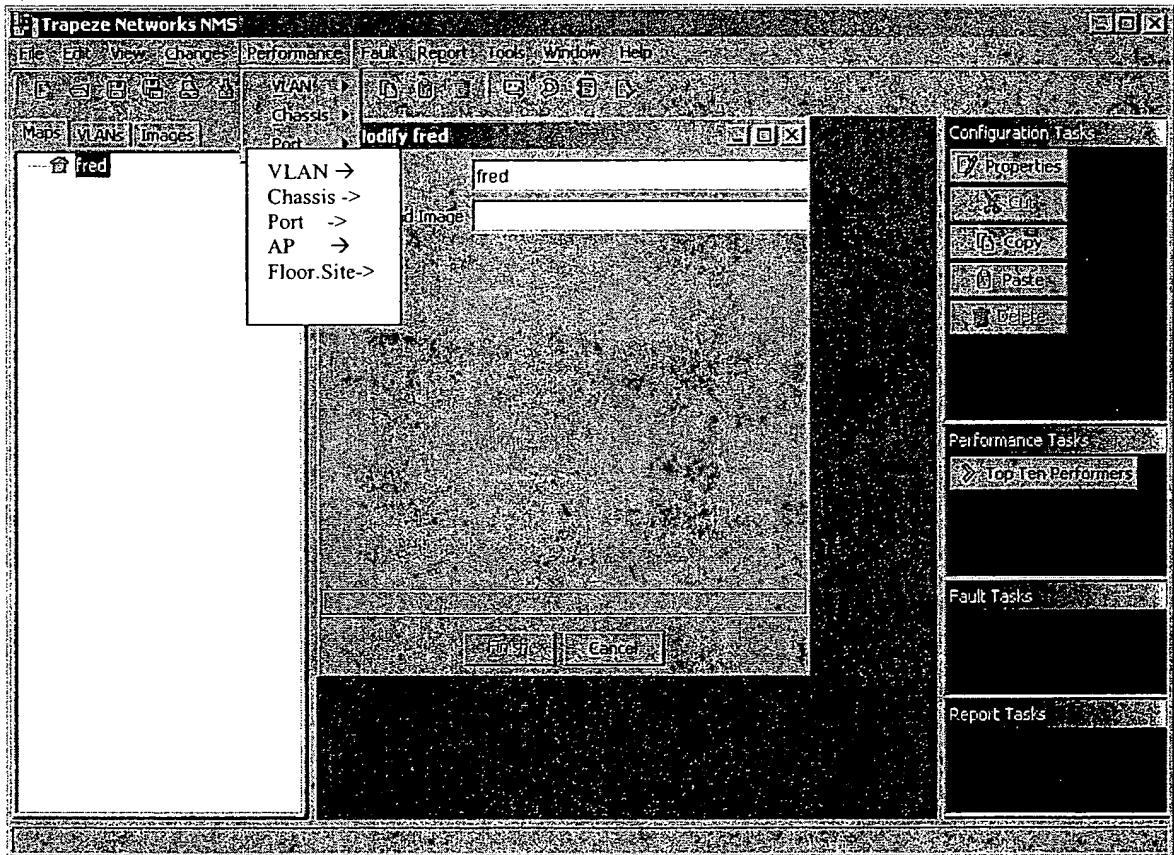
Pre-conditions	JumpPad is connected to the selected DP device
Post-conditions	JumpPad displays the File System for a particular DP and performs certain file system operations.
Main-Flow	<ol style="list-style-type: none"> 1. User selects a DP device and chooses "File System" menu item under "Config" menu. 2. JumpPad query DP with the XML/CLI interface for all the files and directories under the DP hard disks and displays the status and contents of the files such as file size, file type, and last modified time. 3. User can perform file management operations such as rename the file/directory, delete a file/directory, or compact a file (if supported) using the standard Edit menu. 4. JumpPad will send the request for the above operation via XML/CLI interface to the DP device. 5. Upon receiving successful response from the DP, JumpPad presents the necessary changes to the user.
Exceptions	If the device is not connected or Unmanaged, an exception will be thrown "Can not communicate to the DP".
Alternate Flows	
Issues & Notes	Do we need to have this operation be protected by some kind of privilege? (It is kind of risky to have NMS system to modify the file system on DP).

6.6 PERFORMANCE MANAGEMENT

This section describes the performance management capabilities within the. The performance parameters will be easily accessible from the configuration views of the network. All performance options are **ONLY** available on actively managed network elements. That is, a user will not be able to monitor performance on a configuration element that has not yet been deployed.

JumpPad will retrieve all performance/statistics information from the device on demand and provide flexible way of viewing the graphs in different formats such as Graph or chart. JumpPad operations and actions are object-based and context-sensitive. If a user selects an object like VLAN, or port, and he can launch the Performance/Statistics Graphs from the **Performance** menu for a VLAN or port. The user can also launch the performance/statistics task from the right-hand side Performance tasks list.

If the user does not select a particular object such as VLAN or DP, launching the Chassis menu will prompt the user to select a DP first, and then bring up the Performance graph for that object.



- **Performance Menu**

The Performance menu allows the user to retrieve and view the Performance and Statistics of a selected object, such as VLAN, Chassis, or port.

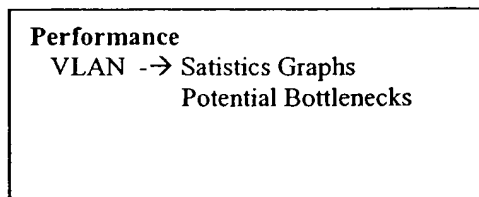
- **VLAN Menu Item**

- VLAN Menu Item provides the General Health, Graph and Chart Statistics, and potential bottlenecks for the VLAN.
- Chassis Menu Item
 - Chassis Menu Item provides the General Health, Graph and Chart Statistics, and potential bottlenecks for a selected Chassis.
- Port Menu Item
 - Port Menu Item provides the General Health, Graph and Chart statistics for a selected port.
- AP Menu Item
 - AP Menu Item provides the General Health, Graph and Chart statistics for a selected AP (including some wireless stats).
- Floor.Site Menu Item
 - VLAN Menu Item provides the General Health, Graph and Chart Statistics, potential bottlenecks for the Container (Floor, Building or Site).

All of the performance option panels will be polled periodically for the data. The poll rate will be configurable per panel but a default will be configurable as part of the application preferences.

6.6.1 VLAN LEVEL PERFORMANCE

Selection: The user selects a VLAN from any organizer view and selects Performance Menu->VLAN for any of the submenu such as Statistics Graphs or Potential Bottlenecks.



6.6.1.1 PERFORMANCE->VLAN ->STATISTICSG GRAPHS

This option provides a context view with the DP's statistics in a table for all ports on the DP. There will be several parameters that the user can select which parameter that the user would like to see the Graphs or views. The user can select whether he wants to view the statistics via table or graph.

- The following statistics will be shown per VLAN
 - What are the statistics on a VLAN level
 - Number Of Clients

- Each column of the table will be sort able so the user can sort based on the top packets/bytes in/out per DP.
- The context view will also have the ability to display all of the data in a time graph rather than being tabulated.
- The user will be able to select a port row in the table and invoke a context graph view for that particular port only.

6.6.1.2 PERFORMANCE->VLAN ->POTENTIAL BOTTLENECKS

This option provides a context view that lists the APs currently connected to the DP that may have potential bottleneck/throughput problems. This list may be empty in which case the panel will show "none".

6.6.2 DP LEVEL PERFORMANCE

Selection: The user selects DP from any organizer view. All of the performance option panels will be polled periodically for the data. The poll rate will be configurable per panel but a default will be configurable as part of the application preferences.

Performance
 Chassis -> Statistics Graphs
 Potential Bottlenecks

6.6.2.1 PERFORMANCE->CHASSIS ->STATISTICS GRAPHS

This option provides a context view with the DP's statistics in a table for all ports on the DP. There will be several parameters that the user can select which parameter that the user would like to see the Graphs or views. The user can select whether he wants to view the statistics via table or graph.

- The following statistics will be shown per port
 - Packets/Bytes In
 - Packets/Bytes Out
 - Number Of Clients
- Each column of the table will be sort able so the user can sort based on the top packets/bytes in/out per port.

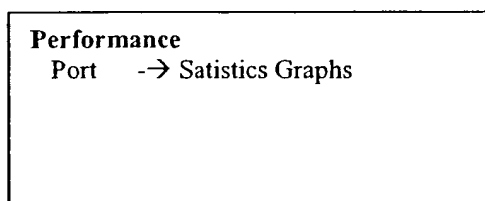
- The context view will also have the ability to display all of the data in a time graph rather than being tabulated.
- The user will be able to select a port row in the table and invoke a context graph view for that particular port only.

6.6.2.2 *PEFORMANCE->CHASSIS -> POTENTIAL BOTTLENECKS*

This option provides a context view that lists the APs currently connected to the DP that may have potential bottleneck/throughput problems. This list may be empty in which case the panel will show "none".

6.6.3 PORT LEVEL PERFORMANCE

Selection: The user selects a Port from any organizer view. All of the performance option panels will be polled periodically for the data. The poll rate will be configurable per panel but a default will be configurable as part of the application preferences.



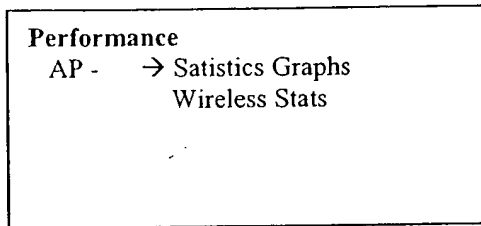
6.6.3.1 *FAULT->PORT -> STATISTICS GRAPH*

This option provides a context view with the Port's statistics in a table for a port. There will be several parameters that the user can select which parameter that the user would like to see the Graphs or views. The user can select whether he wants to view the statistics via table or graph.

- The following statistics will be shown for a port
 - Packets/Bytes In
 - Packets/Bytes Out
 - Number Of Clients
- Each column of the table will be sort able
- The context view will also have the ability to display all of the data in a time graph rather than being tabulated.

6.6.4 AP LEVEL PERFORMANCE

Selection: The user selects AP from any organizer view and launches the menu under Performance->AP related statistics options.



6.6.4.1 PERFORMANCE->AP->STATISTICS GRAPHS

This option provides a context view with the AP's statistics in a table for all clients on the AP.

- The following statistics will be shown per AP
 - Packets/Bytes In
 - Packets/Bytes Out
 - Number Of Clients
- Each column of the table will be sort able so the user can sort based on the top packets/bytes in/out per client.
- The context view will also have the ability to display all of the data in a time graph rather than being tabulated.
- The user will be able to select a client row in the table and invoke a context graph view for that particular client only.

6.6.4.2 PERFORMANCE->AP->WIRELESS STATS

This option provides a context view with the AP's wireless statistics in a table for all clients on the AP.

- The following statistics will be shown per AP
 - Wireless stats?
- Each column of the table will be sort able so the user can sort based on the top wireless stats per client.
- The context view will also have the ability to display all of the data in a time graph rather than being tabulated.
- The user will be able to select a client row in the table and invoke a context graph view for that particular client only.

6.6.5 FLOOR, BUILDING, SITE LEVEL PERFORMANCE

Selection: The user selects a floor or building or site from any organizer view. All of the performance option panels will be polled periodically for the data. The poll rate will be configurable per panel. For the purposes of this section a container can be a floor, a building or a site. The element selected will ultimately constrain the list of devices shown in the particular performance panel.

Performance Floor.Site→ Statistics Graphs Potential Bottlenecks Client Density
--

6.6.5.1 PERFORMANCE->FLOOR.SITE -> STATISTICS GRAPHS

This option provides a context view with the DP/AP's statistics in a table for all clients on the floor, building, or site.

- The following statistics will be shown per AP
 - Packets/Bytes In
 - Packets/Bytes Out
 - Number Of Clients
- Each column of the table will be sort able so the user can sort based on the top packets/bytes in/out per client.
- The context view will also have the ability to display all of the data in a time graph rather than being tabulated.
- The user will be able to select a client row in the table and invoke a context graph view for that particular client only.

6.6.5.2 PERFORMANCE->FLOOR.SITE -> POTENTIAL BOTTLENECKS

- This option provides a context view that lists the Aps/DPs in the floor, building, or site that may have potential bottleneck/throughput problems. This list may be empty in which case the panel will show "none".

6.6.5.3 PERFORMANCE->FLOOR.SITE -> CLIENT DENSITY

This option shows a map that has varying sizes of graphical objects that represent the number of clients connected to a particular point. So, an AP that has a large percentage of clients (say 50% of the overall number of clients) will be shown 50% larger than the others. As part of the map, the actual total number of clients per AP will be shown beside the object on the map.

○

6.6.6 BASIC RF PERFORMANCE

- Channel Speed (Actual)
- Signal Strength
 - - per client
- Signal 2 noise
 - - per client
- Retransmissions

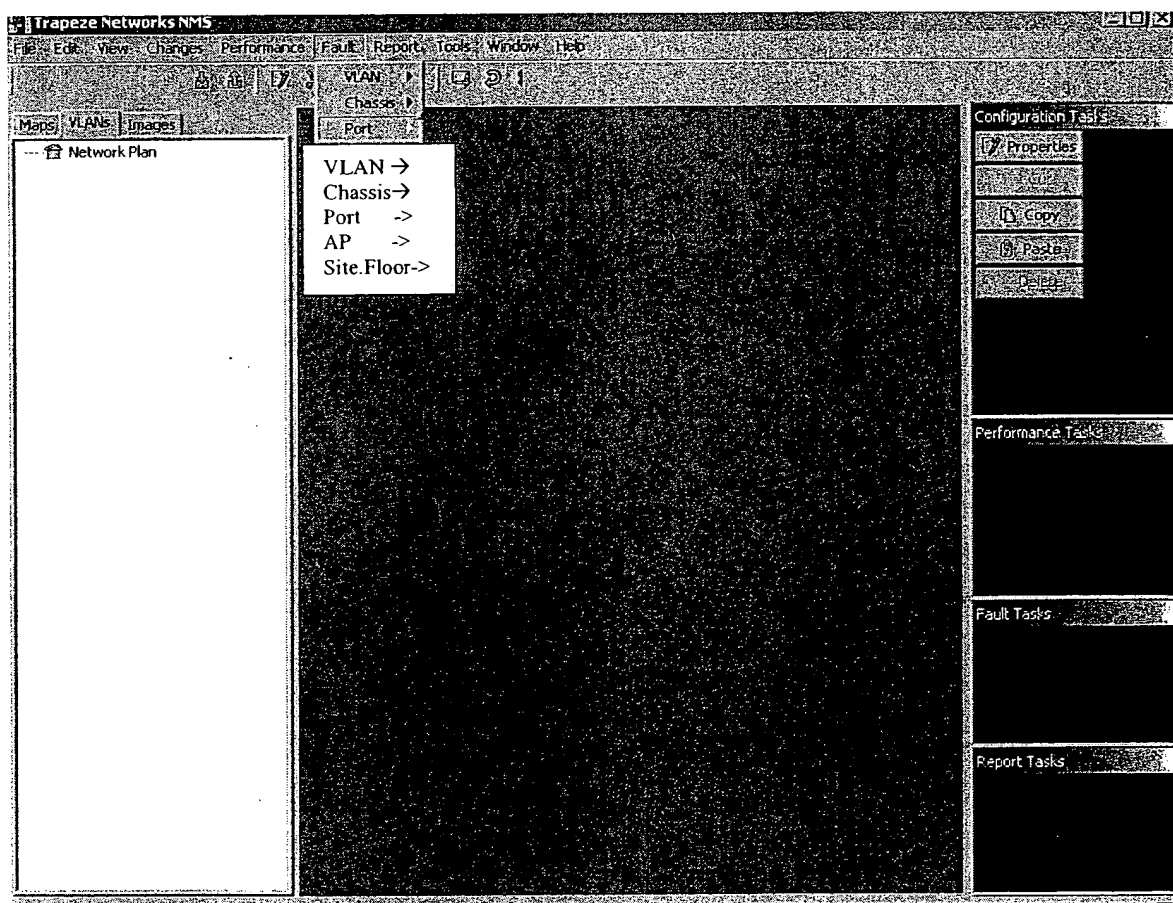
6.6.7 TUNNEL MANAGEMENT STATISTICS

- How many tunnels?
- % of tunnel traffic vs. non-tunnel
- Polls of allowed clients

6.7 FAULT MANAGEMENT

This section will describe the fault management capabilities and embedded features. The fault parameters will be easily accessible from the configuration and/or performance views of the network. JumpPad will retrieve all the event log information from the DP on demand (at least for release 1.0) or periodically and launch the Fault/Event Viewer. JumpPad will provide a flexible filtering tool to filter Events/Faults by DPs, by APs, by Clients, by event category, by severity, and by date/time. DP currently stores a complete set of all the events/faults (probably limited by buffer size or date/time) and JumpPad will use bulk-transfer protocol between JumpPad-DP to retrieve the event/fault data. Currently JumpPad does not have callback mechanisms to automatically receive Faults/Event from the DP. Instead JumpPad will periodically polls DPs to retrieve the Faults/Events. Since HP-Open View provides real time fault management such as alarm correlation and monitoring already, Trapeze JumpPad will not duplicate the same functionality as HP-OpenView.

In post-1.0 release, JumpPad may choose to retrieve historical Fault/Event data from syslog daemon (note that some of the DP-specific events/Faults are not going to be forwarded to Syslog daemon) and use that data to help diagnose or correlate certain error situation and problems over time.



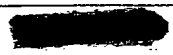
- **Fault Menu**

The Fault menu allows the user to retrieve and view Fault/Event log of the selected object, such as VLAN, Chassis, or port. The user should be able to select any object such as a DP, or a port, and launch the Fault Viewer for that particular object.

- **VLAN Menu Item**
 - VLAN Menu Item provides the Fault/Event Viewer for the VLAN. ??? User needs to select a particular VLAN and launch the Fault menu.
- **Chassis Menu Item**
 - Chassis Menu Item provides the Fault/Event viewer for a selected Chassis.
- **Port Menu Item**
 - Port Menu Item provides the Fault/Event Viewer for a selected port.
- **AP Menu Item**
 - Port Menu Item provides the Fault/Event Viewer for a selected AP.
- **Site.Floor Menu Item**
 - Port Menu Item provides the Fault/Event Viewer for a selected floor, building, or site.

6.7.1 EVENT/FAULT FILTERING CAPABILITY

As stated in previous Menu overview section, all operations and actions are object-based and context-sensitive. If a user selects DP, and he can launch the Fault/Event Viewer from the **Fault** menu filtered out only by that particular DP. If a user wants to see the entire Faults/events in the network, he can select the entire network, and launch the Fault/Event Viewer. All the columns in the Event/Fault viewer can be sorted. The following is a brief screenshot of the Fault/Event Viewer launched:

Date	Time	Severity	Name	Event ID	Description
	01:23:54	Critical	skye	9999384	%SPANTREE-5-PORTDEL_SUCCESS:3/2 deleted from VLAN 1 (PAGP_Group_Rx)

JumpPad will provide a Filter Manager in the Event/Fault viewer, and the user can use the filter manager to create different filtering criteria such as:

- Last 1 hour
- Last 24 hour
- By Severity
- By VLAN
- By DP

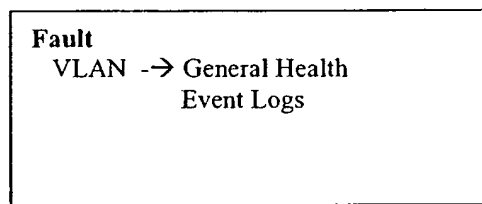
- By AP
- By Client
- By Event Category (Event ID?)

6.7.2 CRITICAL FAULTS THAT JUMPPAD SUPPORTS

JumpPad shall provide some limited Fault correlation and help to monitor the general health of the devices. For example, JumpPad shall identify a list of critical Faults/Events, and upon receiving those, and use the color scheme to identify the critical alarm area of the network. JumpPad shall also identify a list of critical Faults/Events, and upon receiving them, and clear the colors of the critical area. (Not sure how much we can do in this area in R1.0 time frame).

6.7.3 VLAN LEVEL FAULTS

Selection: The user selects a VLAN from any organizer view. And click on Fault->VLAN->General Health.



6.7.3.1 FAULT-> VLAN-> GENERAL HEALTH

This option provides a context view showing the following information for the DP and all associated APs.

- Number of Alarms (per VLAN)
 - For this data, the user will have the option to investigate the actual alarms related to the particular DP or an AP.
- Number of Errors (per VLAN)
 - Same capability to investigate errors as per the alarms.

Pre-conditions	User selects a VLAN and launches the Fault->VLAN->General Health menu option
Post-conditions	A general health view dialog or frame will be launched for the VLAN
Main-Flow	<ol style="list-style-type: none"> 1. JumpPad application finds all the DPs and Ports in the VLAN, and retrieves the faults from all of them. 2. JumpPad application computes and summarizes number of alarms and number of Errors for all the devices in the VLANs. 3. JumpPad presents the queried results and presents them in the list view format in

	the context view.
Exceptions	
Alternate Flows	User selects the Fault->VLAN->General Health menu and select the DP
Issues	

6.7.3.2 FAULT->VLAN -> EVENT LOG

This option provides a context view showing the list of events for the DP and all associated APs. For event, the user will be able to sort by AP, as well as on severity and filter on severity.

Date	Time	Severity	Name	Event ID	Description
[REDACTED]	01:23:54	Critical	DP	9999384	%SPANTREE-5-PORTDEL_SUCCESS:3/2 deleted from VLAN 1 (PAGP_Group_Rx)

6.7.3.3 FAULT->VLAN -> CLIENT AUTHENTICATION ISSUES

This option provides a context view showing the list of authentication failures per VLAN for the clients. Included in this will be authentication failures as well as RF association failures.

Date	Time	Severity	Name	Event ID	Description
[REDACTED]	01:23:54	Critical	DP.AP.client1	9999384	Client Authentication failures
[REDACTED]	01:23:54	Critical	DP	9999384	RF Association Failures

6.7.4 DP LEVEL FAULTS

Selection: The user selects DP from any organizer view. All of the fault option panels will be polled periodically for the data. The poll rate will be configurable per panel but a default will be configurable as part of the application preferences.

Fault

Chassis -> General Health

Event Logs

Client Authentication Issues

6.7.4.1 FAULT->CHASSIS ->GENERAL HEALTH

This option provides a context view showing the following information for the DP and all associated APs.

- Current State (Up/Down)
- Uptime (DP and APs)
- Number of Alarms (DP and APs)
 - For this data, the user will have the option to investigate the actual alarms related to the particular DP or an AP.
- Number of Errors (DP and APs)
 - Same capability to investigate errors as per the alarms.

Pre-conditions	User selects a DP and launch the Fault->Chassis->General Health menu option
Post-conditions	A general health view dialog or frame will be launch for the DP
Main-Flow	<ol style="list-style-type: none"> 1. JumpPad application retrieves the faults for the DP and all APs that the DP manages. 2. JumpPad application computes and summarizes number of alarms and number of Errors for the DP and all the APs the DP manages. 3. JumpPad presents result in the list view format in the context view.
Exceptions	
Alternate Flows	User selects the Fault->Chassis->General Heath menu and select the DP
Issues	

6.7.4.2 *FAULT->CHASSIS ->EVENT LOG*

This option provides a context view showing the list of events for the DP and all associated APs. For event, the user will be able to sort by AP, as well as on severity and filter on severity.

6.7.4.3 *FAULT->CHASSIS -> CLIENT AUTHENTICATION ISSUES*

This option provides a context view showing the list of authentication failures per DP for the clients. Included in this will be authentication failures as well as RF association failures

6.7.5 AP LEVEL FAULTS

Selection: The user selects AP from any organizer view. All of the fault option panels will poll periodically for the data. The poll rate will be configurable per panel but a default will be configurable as part of the application preferences.

Fault

AP -> General Health

Event Logs

Client Authentication Issues

6.7.5.1 *FAULT->AP ->GENERAL HEALTH*

This option provides a context view showing the following information for the AP.

- Current State (Up/Down)
- Uptime (AP)
- Number of Alarms (AP and clients)
 - For this data, the user will have the option to investigate the actual alarms related to the particular client or an AP.
- Number of Errors (AP and Clients)

Same capability to investigate errors as per the alarms.

6.7.5.2 *FAULT->AP -> EVENT LOG*

This option provides a context view showing the list of events for the AP. For event, the user will be able to sort and perform filtering on the Event Log Viewer.

6.7.5.3 *FAULT->AP -> CLIENT AUTHENTICATION ISSUES*

This option provides a context view showing the list of authentication failures per AP for the clients. Included in this will be authentication failures as well as RF association failures.

6.7.6 PORT LEVEL FAULTS

Fault Port -> General Health Event Logs
--

6.7.6.1 *FAULT->PORT -> GENERAL HEALTH*

This option provides a context view showing the following information for the selected Port.


- Current State (Up/Down)
- Uptime (Port)

- Number of Alarms (for the port)
 - For this data, the user will have the option to investigate the actual alarms related to the particular DP or an AP.
- Number of Errors (for the port)
 - Same capability to investigate errors as per the alarms.

Pre-conditions	DP device is connected and NMS is running
Post-conditions	A general health view dialog or frame will be launch for the Port
Main-Flow	<ol style="list-style-type: none"> 1. User selects a Port and launches Fault->Port-General Health menu. 2. JumpPad application retrieves the state of the port (up/down), number of the alarms and errors related to the port from DP. 3. JumpPad presents result in the list view format in the context view.
Exceptions	
Alternate Flows	User selects the Fault->Port->General Heath menu and then select the Port
Issues	

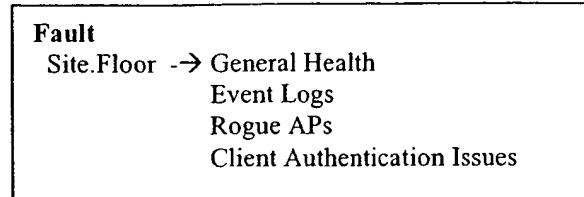
6.7.6.2 FAULT->PORT -> EVENT LOG

This option provides a context view showing all the events for the Port.

Date	Time	Severity	Name	Event ID	Description
	01:23:54	Critical	Dp.port	9999384	xxx

6.7.7 FLOOR, BUILDING, SITE LEVEL FAULTS

Selection: The user selects a floor or building or site from any organizer view and launches the Fault->Site.Floor menu item for a list of available faults/events.



6.7.7.1 FAULT->FLOOR.SITE -> GENERAL HEALTH

This option provides a context view showing the following information for all DP/APs in the container.

- Current State (Up/Down)
- Uptime
- Number of Alarms
 - For this data, the user will have the option to investigate the actual alarms related to the particular Floor, Site, or Building.
- Number of Errors

Same capability to investigate errors as per the alarms.

6.7.7.2 FAULT->SITE.FLOOR -> EVENT LOGS

This option provides a context view showing the list of events for all of the DPs and all associated APs. For event, the user will be able to sort by AP, as well as on severity and filter on severity.

6.7.7.3 FAULT->SITE.FLOOR -> ROGUE APS

This options provides a context view showing the list of rogue APs and allows the user to shown on the topology map where/who detected them.

6.7.7.4 FAULT->SITE.FLOOR -> CLIENT AUTHENTICATION ISSUES

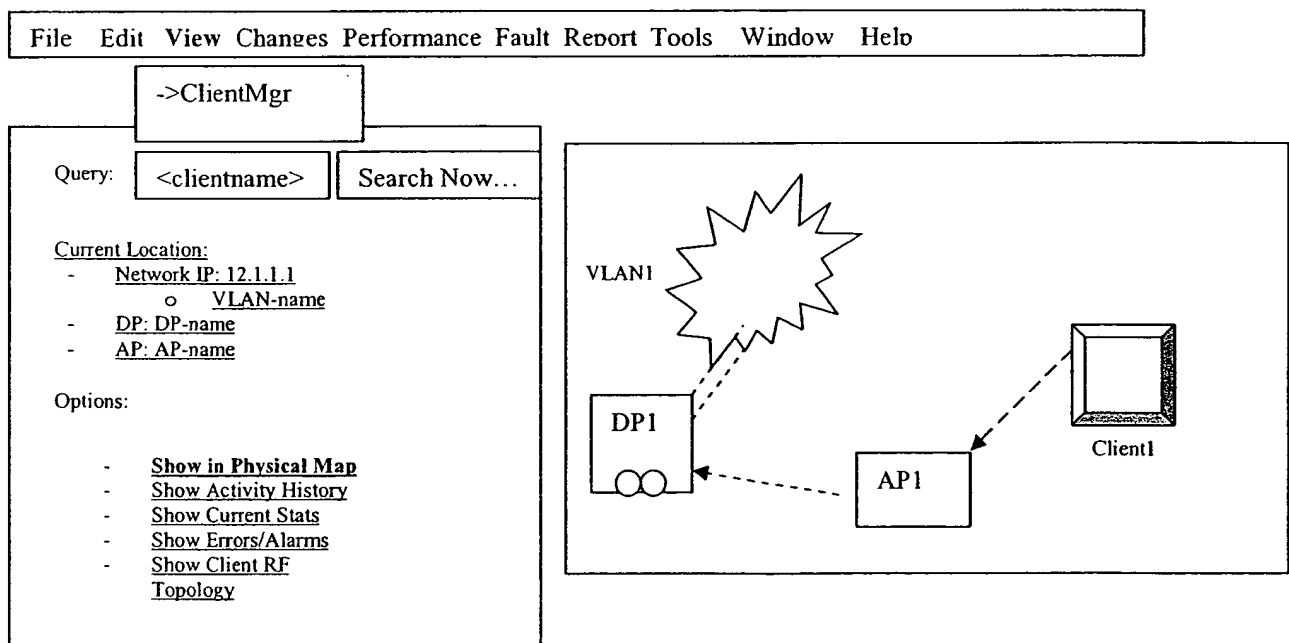
This option provides a context view showing the list of authentication failures per DP/AP for the clients. Included in this will be authentication failures as well as RF association failures.

6.8 CLIENT MANAGEMENT

Jumppad application will provide the network manager with a more client focused view of the world. It will allow the user to review performance/fault/configuration related to a user defined client. User can select "Client Mgr" under "View" menu to bring up the Client Manager view.

The Client Manager view will allow the user to search for a specific client on the network and relate that client to the network infrastructure they are currently using. The client view will also allow the user to perform the following functions:

- Show where the client is currently connected and topological location in the map
- Show where the clients have been and the client activity history
- Show Home DP and Roaming History
- Show the client properties such Signal strength, Channel speed, and authentication info
- Show Client stats information
- Show client fault information
- Show Client RF Topology (?)



6.8.1 LOCATING A CLIENT

The view will allow the user to enter a client name (i.e. user login name or PC name), upon invocation of the search function, the application will find a list of locations (could be more than one) the current DP/AP that the client is currently on. The view panel shows the current location and below the information provides a list of options the user may invoke to review the client

The client query will remember previous queries so that the user may easily find clients that they choose to find often.

[We could provide a way for the user to define a list of clients they always want to find (i.e. Add to track list) and the track list finds all of the clients all of the time.

Pre-conditions	User selects a View->Client Manager
Post-conditions	One or more clients matching the client name are located
Main-Flow	<ol style="list-style-type: none"> 1. User enters Client by IP Address (or host name, or MAC Address) 2. Jumppad will go to each devices in the networks, and query the location of the clients 3. Jumppad displays the list of the clients to the user (there could be more than 1 clients). Each location includes the following information: <ol style="list-style-type: none"> a. Network IP Address: b. DP: c. AP:
Exceptions	
Alternate Flows	
Issues	Do we need to support wildcard in search?

The client information typically includes Network IP address, which AP the client is connected to, and which DP the client is connected to.

- All of the above information will have the ability to relate/link into a more general view of the DP and/or APs views previously defined.
 - For example, once we have found a client, we could allow the user to say “show where connected in RF map” and we would bring up the RF topology map with the particular AP highlighted.

6.8.2 GETTING CLIENT ACTIVITY HISTORY

Once the user has located the client, user can choose the option of : Show Client Activity History. This option will allow the user to locate:

- Home DP
- Roaming History
- Where the client have been (what are the locations that the client have been, and connected to)

<p>Query: <input style="width: 150px;" type="text" value="<clientname>"/> <input type="button" value="Search Now..."/></p> <p><u>Current Location:</u></p> <ul style="list-style-type: none"> - <u>Network IP: 12.1.1.1</u> <ul style="list-style-type: none"> o <u>VLAN-name</u> - <u>DP: DP-name</u> - <u>AP: AP-name</u> <p>Options:</p> <ul style="list-style-type: none"> - <u>Show in Physical Map</u> - <u>Show Activity History</u> - <u>Show Current Stats</u> - <u>Show Errors/Alarms</u> - <u>Show Client RF Topology</u> 	<p>Client Activity History:</p> <p>Home DP Location:</p> <p>Client past locations:</p> <div style="margin-left: 40px;"> <p>location 1:</p> <ul style="list-style-type: none"> -- date-time ---DP ---AP --- Roaming History <p>Location 2:</p> <ul style="list-style-type: none"> -- date-time -- DP -- AP -- Roaming History </div>
--	--

Pre-conditions	A Client has been located.
Post-conditions	All the historical Client locations, home DP, and roaming history will be displayed.
Main-Flow	<ol style="list-style-type: none"> 1. User selects a client, and clicks on "Show Activity History" 2. Jumppad will go to each devices in the networks, and query DP whether they have any information about that client, and retrieve the information. 3. Jumppad displays the list of the client locations to the user: <ol style="list-style-type: none"> d. Client Home DP e. Client past locations f. Client roaming history
Exceptions	
Alternate Flows	
Issues	Do we need to support wildcard in search?

6.8.3 GETTING STATS BY CLIENT

Once the user has located the client, he can view current statistics for that client. Jumppad provides information about the wireless statistics and performance data for each client.

- Packets/bytes re-transmitted on current AP
- Signal to noise

<p>Query: <input style="width: 150px;" type="text" value="<clientname>"/> <input type="button" value="Search Now..."/></p> <p><u>Current Location:</u></p> <ul style="list-style-type: none"> - <u>Network IP: 12.1.1.1</u> <ul style="list-style-type: none"> ○ <u>VLAN-name</u> - <u>DP: DP-name</u> - <u>AP: AP-name</u> <p><u>Options:</u></p> <ul style="list-style-type: none"> - <u>Show in Physical Map</u> - <u>Show Activity History</u> - <u>Show Current Stats</u> - <u>Show Errors/Alarms</u> - <u>Show Client RF Topology</u> 	<p>Client Current Stats:</p> <p>Packets/bytes sent/received:</p> <p>Signal to noise:</p> <p>Packets error/retransmissions</p>
--	--

Pre-conditions	A Client has been located.
Post-conditions	All current stastics and performance data for the client will be displayed.
Main-Flow	<ol style="list-style-type: none"> 1. User selects a client, and clicks on "Show Current Statistics" 2. Jumppad will go to the devices that the Client is currently connecting on, and query stats from the device.. 3. Jumppad displays the list of the client locations to the user: <ol style="list-style-type: none"> g. Packets/bytes sent/received h. Signal to noise ratio i. Pacekts error/retransmissions
Exceptions	
Alternate Flows	
Issues	

6.8.4 GETTING FAULTS BY CLIENT

User can also look at the Faults/Errors information for that client once the client is located. The following parameters will be collected:

- Errors/faults on the wireless and wired network for this client
- Number of failed attempts of authentication/logins

<p>Query: <input style="border: 1px solid black;" type="text" value=" <clientname> "/> <input style="border: 1px solid black;" type="button" value="Search Now..."/></p> <p><u>Current Location:</u></p> <ul style="list-style-type: none"> - <u>Network IP: 12.1.1.1</u> <ul style="list-style-type: none"> ○ <u>VLAN-name</u> - <u>DP: DP-name</u> - <u>AP: AP-name</u> <p><u>Options:</u></p> <ul style="list-style-type: none"> - <u>Show in Physical Map</u> - <u>Show Activity History</u> - <u>Show Current Stats</u> - <u>Show Errors/Alarms</u> - <u>Show Client RF Toplogy</u> 	<p>Client Current Faults:</p> <p>Packets/bytes erros:</p> <p>Failed Athentication attempts:</p> <p>Etc:</p>
--	--

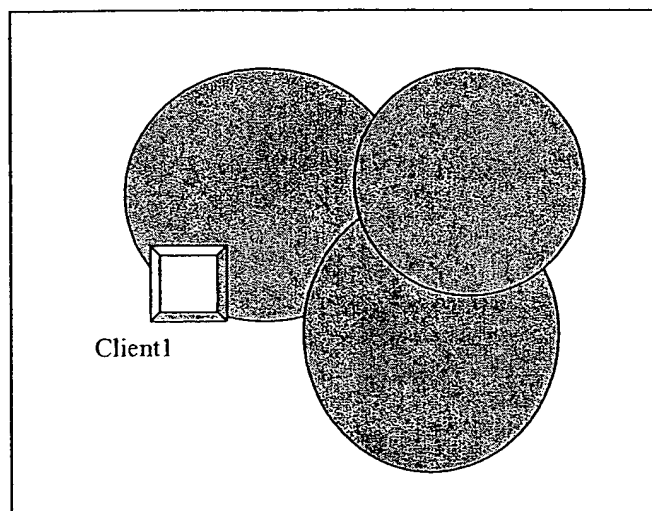
Pre-conditions	A Client has been located.
Post-conditions	All current faults data for the client will be displayed.
Main-Flow	<ol style="list-style-type: none"> 1. User selects a client, and clicks on "Show Current Statistics" 2. Jumppad will go to all the devices that the Client has been (past locations) and query faults/events from the device.. 3. Jumppad displays the list of the client locations to the user: <ol style="list-style-type: none"> j. Packets/bytes errors/retransmissions k. Failed Athentication attempts l. Login failed errors
Exceptions	
Alternate Flows	

Issues	
--------	--

6.8.5 SHOW CLIENT RF TOPOLOGY

User can also look at the RF topology with respect with where the client is located.

Query:	<input type="text" value="<clientname>"/>	Search Now...
Current Location:		
- <u>Network IP: 12.1.1.1</u>		
o <u>VLAN-name</u>		
- <u>DP: DP-name</u>		
- <u>AP: AP-name</u>		
Options:		
- <u>Show in Physical Map</u>		
- <u>Show Activity History</u>		
- <u>Show Current Stats</u>		
- <u>Show Errors/Alarms</u>		
- <u>Show Client RF Topology</u>		



7 NOTES

[Delete this section once everything is covered]

7.1 ORGANIZER VIEWS

This section describes the various panels/views that appear in the left-hand side of the application window. Each organizer will provide a variety of functions as described in each sub-section.

7.1.1 NETWORK PLAN ORGANIZER

The Network Plan Organizer is the parent organizer of all other views and organizers. The network plan organizer provides the user with a tree layout of the currently opened network plan broken down into four levels (map, site, building, and floor). The map level is not shown as part of the hierarchy as this is the root of the tree and therefore is a single instance. It is the current application context. All other views...etc are based on the current network plan object.

Network Plan

- Menu Option: File -> New Network Plan... (Accelerator: Ctrl+N, Mnemonic: N)
- Menu Option: File -> Open Network Plan... (Accelerator: Ctrl+O, Mnemonic: O)
- Menu Option: File -> Close Network Plan... (Accelerator: Ctrl+L, Mnemonic: L)
- Menu Option: File -> Save Network Plan... (Accelerator: Ctrl+S, Mnemonic: S)
- Menu Option: File -> Save As Network Plan...(Accelerator: <none>, Mnemonic: <none>)
- Menu Option: Edit -> Delete (Accelerator: Ctrl+D, Mnemonic: d)

The network plan tree view (on the Organizer View) shows the entire active network plan user has selected to manage. It shows the hierarchy of the Site, Building, and Floor. Within each floor, the tree view shows how many DPs there are in the floor, and how many APs that the DP are talking to. One can view or modify the attributes of a DP when a DP is selected, and view all the attributes for a port when a port is selected. One can also configure all the DNS entries, IP protocol configurations, and all the APs that the DP is connecting to.

If the user clicks on the "DP1" node, the right side map view of the DP1 node will be high-lighted to show where the node is in the map view (as shown below). The same applies to the AP also.

The network plan map view shows where the DPs and APs are physically on the floor plan. One can choose to hide the background dxf map file if he chooses to. User should be able to select on the DP or AP object on the map as well to perform the same operation as in the tree view.

Note that the user can switch to the VLAN logical view any time.

7.2 CONTEXT VIEWS

7.2.1 DXF/PHYSICAL CONTEXT

- Shows a DXF Map and plots the positions of DPs and APs, links...etc

7.2.2 GEOGRAPHIC CONTEXT

- Shows a JPEG background of US? Or other?

7.2.3 LOGICAL CONTEXT

- Shows logical layout for L3, L2...etc

7.2.4 RF CONTEXT

- Shows RF topology map for a DP or map?

-

7.2.5 OBJECT CONTEXT EDITOR/VIEWER

- Allows the user to edit the currently selected object parameters in line as well as show the values when not editing
 - Edit a VLAN attributes or show read-only

7.3 TOPOLOGY SUPPORT

One of the main goals of the product is to provide good topology configuration for the DP/AP mix. This section should describe what and how we will show topology.

7.3.1 PHYSICAL TOPOLOGY

The following features are desired:

- For a single DP we will want to show what APs are connected to the DP.
- What ports the APs are connected to.
- The ability to enable/disable a particular port an AP is connected on.
- Easily reference statistical information for a particular AP or port on the DP.
- Shown preferably on top of a physical layout map of the building.
- Other views could define the "logical" physical topology.

7.3.2 RF TOPOLOGY

The following features are desired:

- Show the RF topology
 - How do we do Channel Assignments?
 - RF Coverage??
 - Interference?
- Hotspots
- Overlaps
- Dead spots
- Overlay the RF topology with the physical topology map.
- Allow the user to switch off the AP? Can we support this? I.e. don't disable the port in the DP but switch off the RF capability in the AP. Do we need to do this?
- Configure RF related capabilities for the set of APs
 - As a whole
 - Per Ap
 - Maybe have a set of default AP parameters that if you don't override for an AP it uses the default parameters. That way we can configure "as a whole" by setting the default parameters.

In the above RF Topology map, each color represents different channels and their coverage.

7.3.3 CLIENT TOPOLOGY

The following features are desired:

- Show what clients are currently connected to a particular AP.
- Overlay this topology with RF and physical topologies.
- Per client what information do we want to show:
 - IP address?

- Hostname?
- Wireless parameters?
- “Home” DP?

{TBD}

As part of the main application view there will be a variety of tasks available

- 1) Image management
 - a. Upgrading/Downgrading AP/DPs combinations
 - i. Compatibility checks
 - ii. Macros across multiples of them
- 2) Certificate Control
- 3) Client Management
 - a. Finding clients
 - b. Setup QoS per client/allow/deny
- 4) Topology viewers
 - a. “what if scenarios”
- 5) Performance/Fault Analysis
 - a. Hotspots
 - b. Health monitor
 - c. Faults
 - d. Security issues
 - e. Basic throughput viewing...etc
- 6) Configuration Parameters
 - a. All of the box config that is required.
 - b. Ability to import new config and download to box and make active
 - c. Ability to export new config to local hard disk

User Management

Find Users [X]

Find One or More Users

Select the type of search you want:

☒ Find a specific user ☐ Find all users

User Name:

IP Address:

MAC Address:

VLAN Name:

Within Scope

Mobility Domain: [v]

Mobility Exchange: [v]

Select the option on how you want to find the user(s):

Previous Next Finish Cancel

Find Users

Find a User

Search For

ALL - ALL

Within

MobilityDomain = Default

Results

User Name	IP Address	MAC Address	Location	Add to Watch List
user121	192.168.1.88	00:ce:64:4d:8b:bf	Default, MX-100-1, ...	<input type="checkbox"/>
user269	192.168.1.75	00:7d:19:fd:9f:2a	Default, MX-100-1, ...	<input type="checkbox"/>
user105	192.168.1.92	00:ce:bb:17:fc:45	Default, MX-100-1, ...	<input type="checkbox"/>
user384	192.168.1.55	00:4c:1a:19:ef:d3	Default, MX-100-1, ...	<input type="checkbox"/>
user363	192.168.1.60	00:1a:e0:a8:51:c5	Default, MX-100-1, ...	<input type="checkbox"/>

Status

Search User started

Search Result: 20 found

Completed finding users

Previous

Next

Finish

Cancel

Trapeze Networks RingMaster 1.0.0.38.0 QA : Plan (Test2)

File Edit View Changes Monitor Tools Windows Help

Mobility Domains

- Default
 - Domain Policies
 - MX-100-1
 - Scheduled RF Sweeps
- Non-Trapeze APs

Sites

- Campus
 - Building1
 - Floor1

Mobility Domain Layout: Default

MX-100-1

Mobility Domain Information

Operational Status: Up (service degraded - major) Mobility Domain Name: Default

Seed Member: 10.141.10:MX-100-1

Find Details Performance Remove Watch Terminate Location

Watch List

User Name	IP Address	MAC Address	Location
User368	192.168.1.88	00:99:61:22:bf:2a	Default, MX-100-1, MP15, Radio1
User256	192.168.1.7	00:a3:5a:e0:c8:e7	Default, MX-100-1, MP11, Radio1
User399	192.168.1.58	00:4a:71:94:6a:df	Default, MX-100-1, MP13, Radio1
User110	192.168.1.38	00:00:00:00:00:00	Default, MX-100-1, MP12, Radio1
User251	192.168.1.4	00:9b:11:7d:b5:23	Default, MX-100-1, MP4, Radio1 (7 dBm, Ch.6)

Managed Mobility Exchanges Verification User Management

View User Details

User Name: User251 IP Address: 192.168.1.4

MAC Address: 00:9b:11:7d:b5:23 Start Time: [REDACTED] 14:43 PST

Stop Time: [REDACTED] 13:08 PST Authentication Server: [REDACTED]

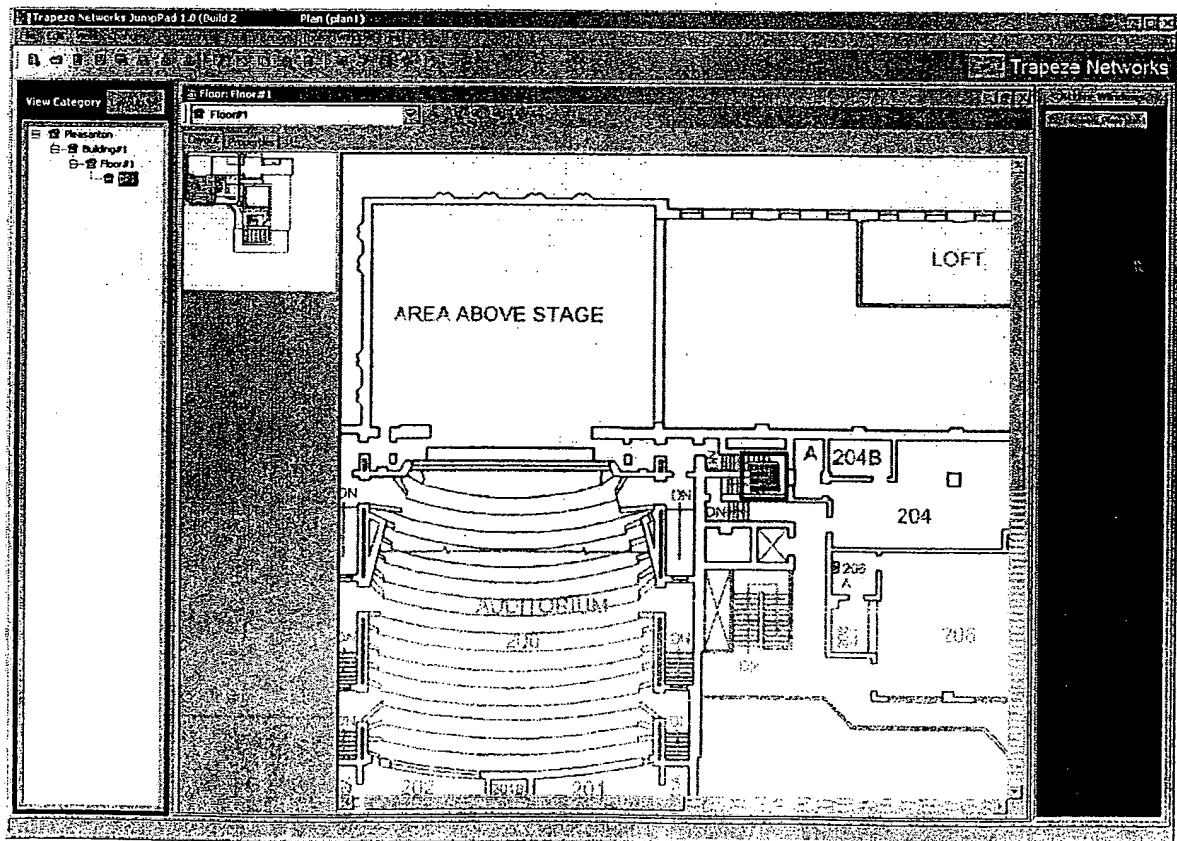
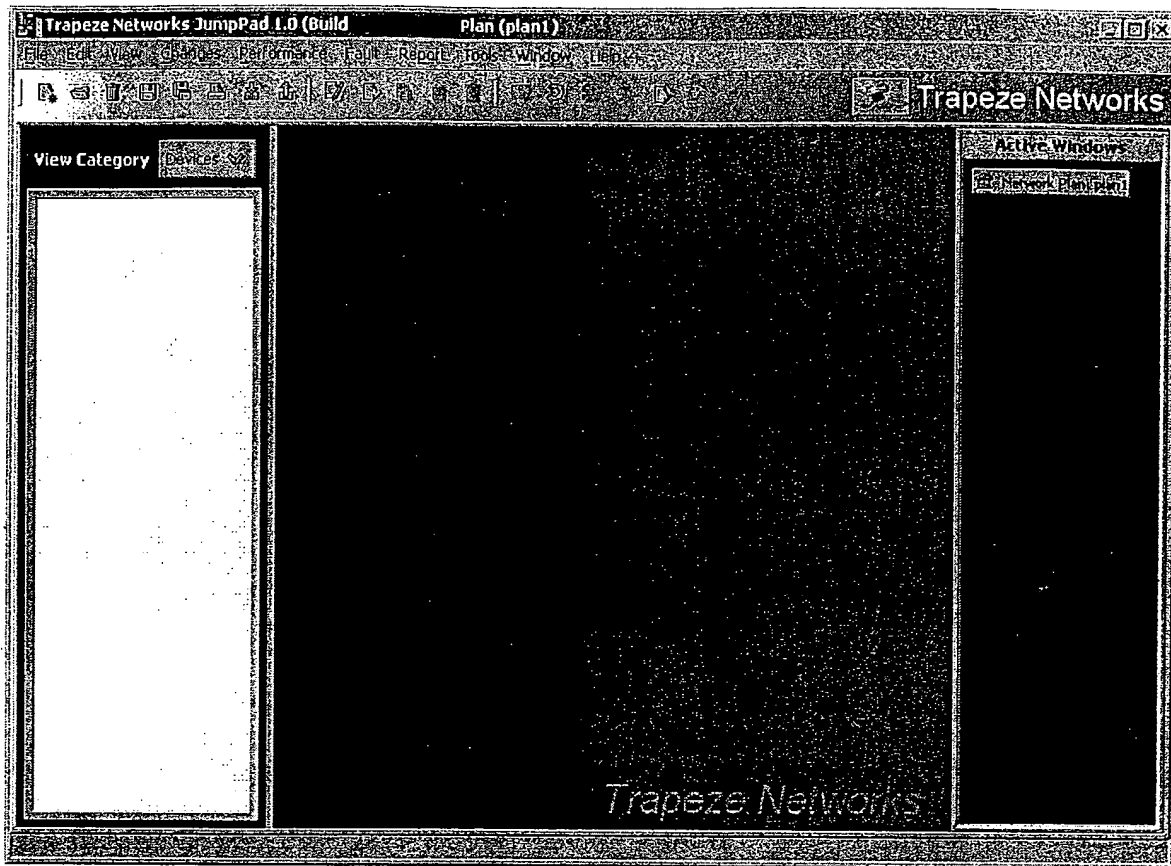
EAP Type: EAP-TLS Session State: Active

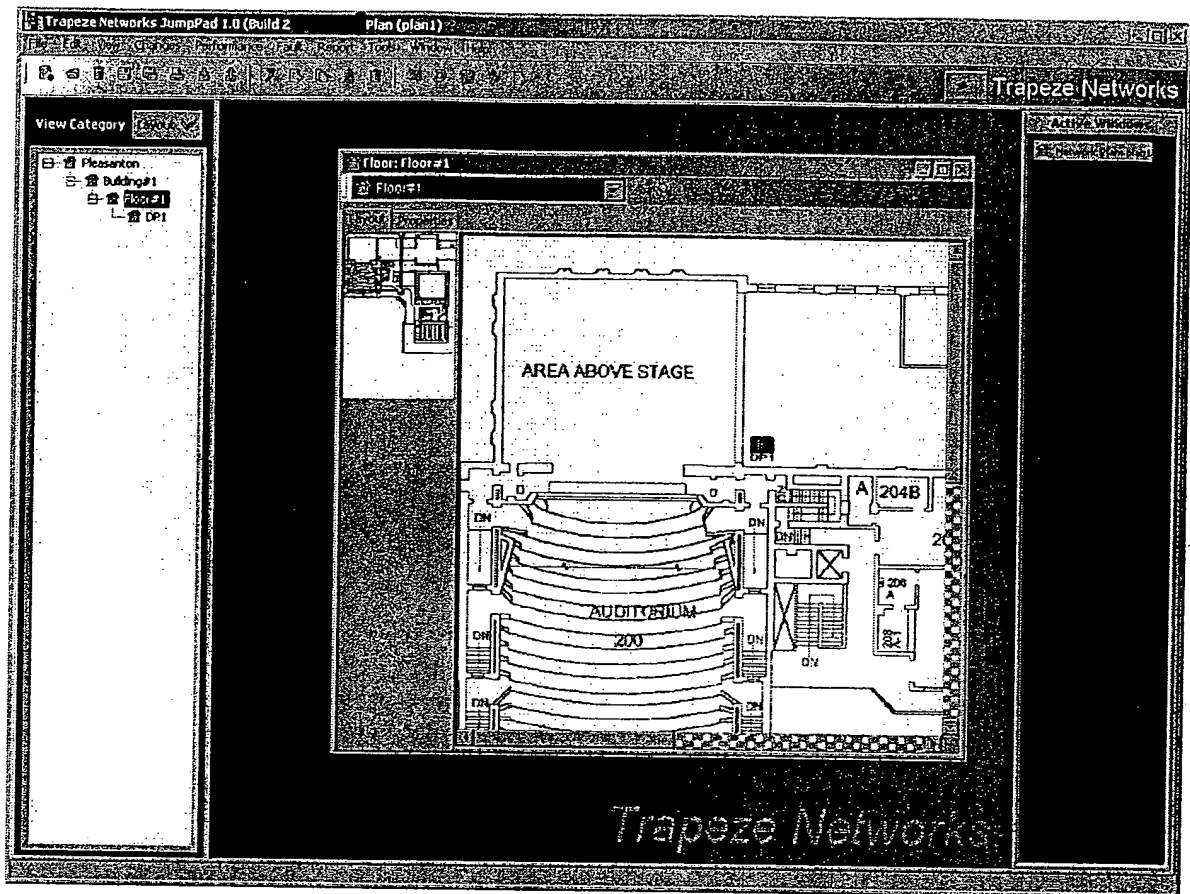
RSSI: 88

Roaming History

MP/Radio	Start Time
Default, MX-100-1, MP4, Radio1 (7 dBm, Ch.6)	[REDACTED] 13:08 PST

Close





Modify Device VLAN: VLAN: 1 Default

VLAN Number: 1

VLAN Name:

IP Address:

State:

MTU (Bytes):

SAID:

Enter the VLAN's name

Review Network Changes

Total Changes: 31

Object: **plan1** Change: **DP1**

☐ Ports/APs

- ☐ P1-AP
- ☐ P2-AP
- ☐ P3-AP
- ☐ P4-AP
- ☐ P5-AP
- ☐ P6-AP
- ☐ P7-AP
- ☐ P8-AP
- ☐ P9-AP
- ☐ P10-AP
- ☐ P11-AP
- ☐ P12-AP
- ☐ P13-AP
- ☐ P14-AP
- ☐ P15-AP
- ☐ P16-AP
- ☐ P17-AP
- ☐ P18-AP
- ☐ P19-AP
- ☐ P20-AP
- ☐ P21
- ☐ P22

Create Chassis **DP1**

Attributes	
Attribute	Value
Managed	Yes
Device Name	DP1
Device Type	V1-20PORT
Contact	
Version	

Open Network Plan

Name	Created By	Created On	Last Change By	Last Change On
d1	allan	16:31	allan	16:31
d2w	allan	14:12	allan	14:12

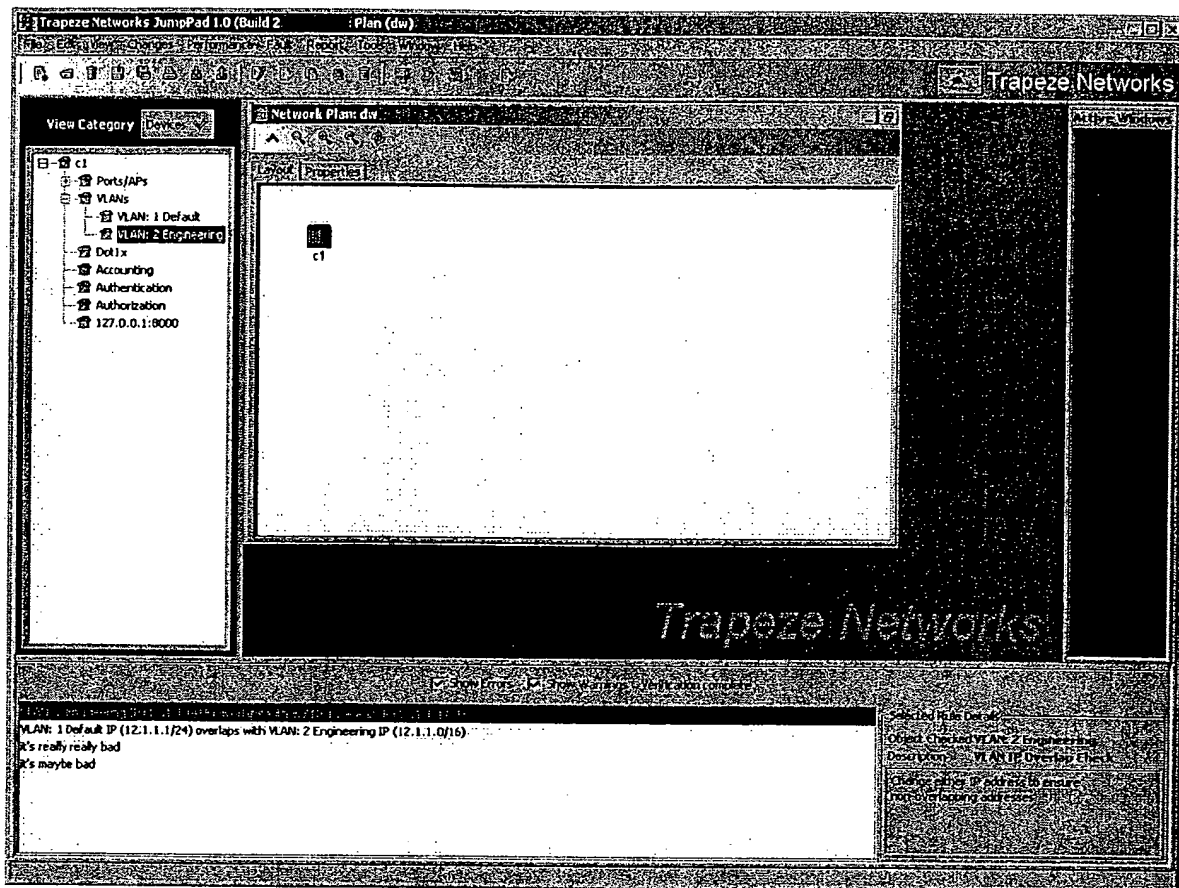
Click on Next to continue

Previous

Next

Finish

Cancel



nms-schedule

Project Start: Mon [REDACTED]
Project Finish: Mon [REDACTED]

Tasks

ID	Task Name	Duration	Start	Finish	Resource Names
1	Implementation	237 days	Mon [REDACTED]	Fri [REDACTED]	
2	Milestone 1 (Basic Workflow)	33 days	Mon [REDACTED]	Fri [REDACTED]	
3	Learning Curve	5 days	Mon [REDACTED]	Fri [REDACTED]	Sudhir
4	Infrastructure Work	25 days	Mon [REDACTED]	Tue [REDACTED]	
5	Persistence	7 days	Mon [REDACTED]	Tue [REDACTED]	
6	XML Mapping For Device	1 day	Mon [REDACTED]	Mon [REDACTED]	Yun
7	Save Plan	3 days	Tue [REDACTED]	Thu [REDACTED]	Yun
8	Open Plan	2 days	Fri [REDACTED]	Mon [REDACTED]	Yun
9	Delete Plan	1 day	Tue [REDACTED]	Tue [REDACTED]	Yun
10	Object Model/Transactions	5 days	Mon [REDACTED]	Tue [REDACTED]	Jim
11	DP Simulator Changes	3 days	Wed [REDACTED]	Fri [REDACTED]	Jim
12	Network IO	9 days	Mon [REDACTED]	Mon [REDACTED]	Jim
13	UI	25 days	Mon [REDACTED]	Tue [REDACTED]	
14	New Plan	5 days	Mon [REDACTED]	Fri [REDACTED]	Charleston
15	Open Plan	2 days	Mon [REDACTED]	Tue [REDACTED]	Charleston
16	Save Plan	2 days	Wed [REDACTED]	Thu [REDACTED]	Charleston
17	Save As Plan	1 day	Fri [REDACTED]	Fri [REDACTED]	Charleston
18	Delete Plan	2 days	Mon [REDACTED]	Tue [REDACTED]	Charleston
19	Basic Wizard Updates	3 days	Mon [REDACTED]	Wed [REDACTED]	Allan
20	Revert	2 days	Thu [REDACTED]	Fri [REDACTED]	Allan
21	Deploy	5 days	Mon [REDACTED]	Fri [REDACTED]	Allan
22	View Layouts and UI Navigation	10 days	Mon [REDACTED]	Tue [REDACTED]	Charleston,Sudhir
23	Basic Config Model (Mapping/Model/UI)	14 days	Mon [REDACTED]	Mon [REDACTED]	
24	Basic Device and Ports	12 days	Wed [REDACTED]	Mon [REDACTED]	Yun

25	Device VLAN	10 days	Mon [REDACTED]	Fri [REDACTED]	Sudhir
26	Basic Verification	5 days	Mon [REDACTED]	Fri [REDACTED]	
27	Config Rules	5 days	Mon [REDACTED]	Fri [REDACTED]	Allan
28	Milestone 1 Unit Tests	5 days	Mon [REDACTED]	Fri [REDACTED]	Yun,Jim,Charleston,Allan,
29	Milestone 2 (Config Rev2, Client and Performance)	55 days	Mon [REDACTED]	Mon [REDACTED]	
30	Config Model Updates (Mapping/Model/UI)	43 days	Wed [REDACTED]	Mon [REDACTED]	
31	AAA	6 days	Wed [REDACTED]	Wed [REDACTED]	Yun
32	Dot1x	8 days	Thu [REDACTED]	Mon [REDACTED]	Yun
33	IP Aliasing Support	2 days	Fri [REDACTED]	Mon [REDACTED]	Kishan
34	RF Planning	45 days	Mon [REDACTED]	Mon [REDACTED]	
35	RF Planning Design	7 days	Mon [REDACTED]	Tue [REDACTED]	Sudhir
36	Model Definition + Persistence	5 days	Wed [REDACTED]	Tue [REDACTED]	Sudhir
37	Floor Wizard (Skeleton)	5 days	Wed [REDACTED]	Tue [REDACTED]	Sudhir
38	Area Wizard	2 days	Wed [REDACTED]	Thu [REDACTED]	Sudhir
39	Network Design Operation Wizard	5 days	Fri [REDACTED]	Thu [REDACTED]	Sudhir
40	Add New Obstacle and Loss Assignments	3 days	Fri [REDACTED]	Wed [REDACTED]	Sudhir
41	Network Design - Finalize Algorithm	5 days	Thu [REDACTED]	Wed [REDACTED]	Sudhir
42	Network Design - Algorithm Implementation	8 days	Thu [REDACTED]	Mon [REDACTED]	Sudhir
43	Calculation and Display of Coverage	5 days	Tue [REDACTED]	Mon [REDACTED]	Sudhir
44	Performance (UI/Model/Mapping)	19 days	Mon [REDACTED]	Thu [REDACTED]	
45	Net IO Infrastructure Updates	10 days	Mon [REDACTED]	Fri [REDACTED]	Jim
46	UI Infrastructure Updates for Perf	3 days	Mon [REDACTED]	Wed [REDACTED]	Allan
47	Port Level	8 days	Thu [REDACTED]	Mon [REDACTED]	Allan
48	Chassis Level	8 days	Tue [REDACTED]	Thu [REDACTED]	Allan
49	Client	15 days	Tue [REDACTED]	Tue [REDACTED]	
50	Client Design	5 days	Tue [REDACTED]	Mon [REDACTED]	Yun
51	Cluster Config Changes	5 days	Mon [REDACTED]	Fri [REDACTED]	
52	Cluster Model	2 days	Tue [REDACTED]	Wed [REDACTED]	Yun
53	Mapper Support	1 day	Mon [REDACTED]	Mon [REDACTED]	Yun
54	Device Interface Support	2 days	Tue [REDACTED]	Wed [REDACTED]	Jim
55	View Layout Changes	2 days	Thu [REDACTED]	Fri [REDACTED]	Yun
56	Cluster Sync Logic	4 days	Thu [REDACTED]	Wed [REDACTED]	Jim
57	Summary GUI Page	2 days	Tue [REDACTED]	Wed [REDACTED]	Yun
58	Find Client Wizard	3 days	Thu [REDACTED]	Mon [REDACTED]	Yun

59	Network IO Integration	4 days	Thu [REDACTED]	Tue [REDACTED]	
60	Simulate Clusters	1 day	Thu [REDACTED]	Thu [REDACTED]	Jim
61	Implement Client Queries	3 days	Fri [REDACTED]	Tue [REDACTED]	Jim
62	Integration with embedded DP Simulator	14 days	Wed [REDACTED]	Mon [REDACTED]	Jim
63	Config/Image Management (Initial)	4 days	Wed [REDACTED]	Mon [REDACTED]	
64	Design	4 days	Wed [REDACTED]	Mon [REDACTED]	Yun,Jim
65	Jeff Learning Curve	5 days	Tue [REDACTED]	Mon [REDACTED]	Jeff
66	Spanning Tree Model/Mapping/UI	11 days	Tue [REDACTED]	Tue [REDACTED]	Jeff
67	Security Admin (UI/Persistence)	4 days	Wed [REDACTED]	Mon [REDACTED]	Jeff
68	Kishan Learning Curve	4 days	Mon [REDACTED]	Thu [REDACTED]	Kishan
69	Milestone 2 Unit Tests	10 days	Tue [REDACTED]	Mon [REDACTED]	Yun,Sudhir,Jim,Jeff,Kishan
70	Milestone 3 (Verify/Fault/ConfigVersion/Reports)	42 days	Tue [REDACTED]	Fri [REDACTED]	
71	Training	2 days	Tue [REDACTED]	Wed [REDACTED]	Sudhir
72	Policy Updates	8 days	Tue [REDACTED]	Thu [REDACTED]	
73	Integrate Apply/Sync Menu Actions into Single Action and Wizard	5 days	Tue [REDACTED]	Mon [REDACTED]	Allan
74	Resolve Policy Sync Issues in other functions	3 days	Tue [REDACTED]	Thu [REDACTED]	Allan
75	Config Model Updates	14 days	Tue [REDACTED]	Fri [REDACTED]	
76	ISL Config	2 days	Tue [REDACTED]	Wed [REDACTED]	Jeff
77	NTP Config	2 days	Thu [REDACTED]	Fri [REDACTED]	Jeff
78	DNS Client	2 days	Mon [REDACTED]	Tue [REDACTED]	Jeff
79	Logging Config	3 days	Wed [REDACTED]	Fri [REDACTED]	Jeff
80	HTTP Config	2 days	Mon [REDACTED]	Tue [REDACTED]	Jeff
81	ACL	7 days	Thu [REDACTED]	Fri [REDACTED]	Kishan
82	IGMP Snooping	4 days	Tue [REDACTED]	Fri [REDACTED]	Allan
83	VLAN Updates	4 days	Thu [REDACTED]	Tue [REDACTED]	Sudhir
84	RF Planning Updates	24 days	Wed [REDACTED]	Mon [REDACTED]	Sudhir
85	Config/Image Management	24 days	Tue [REDACTED]	Fri [REDACTED]	
86	Initial NetIO API Implementation	5 days	Tue [REDACTED]	Tue [REDACTED]	Jim
87	Net IO Updates for versioning (Cfg/Image/Bootrom Push, Cfg Pull)	3 days	Wed [REDACTED]	Fri [REDACTED]	Jim
88	Config File Push	5 days	Mon [REDACTED]	Fri [REDACTED]	Jim
89	Initial UI Implementation	5 days	Tue [REDACTED]	Mon [REDACTED]	Yun
90	Version Management UI	8 days	Tue [REDACTED]	Thu [REDACTED]	Yun
91	Image Push	5 days	Fri [REDACTED]	Thu [REDACTED]	Yun
92	Image Parsing	6 days	Fri [REDACTED]	Fri [REDACTED]	Yun

93	Jumppad API (Initial Development)	5 days	Fri [REDACTED]	Thu [REDACTED]	Allan
94	Jumppad API Complete	5 days	Fri [REDACTED]	Thu [REDACTED]	Allan
95	Verification Updates	15 days	Mon [REDACTED]	Fri [REDACTED]	
96	Rule System Design Updates	5 days	Mon [REDACTED]	Fri [REDACTED]	Kishan
97	Rule System Implementation	10 days	Mon [REDACTED]	Fri [REDACTED]	Kishan
98	Certificate Handling for DP Comms	2 days	Mon [REDACTED]	Tue [REDACTED]	Jim
99	Boot status display in UI	1 day	Wed [REDACTED]	Wed [REDACTED]	Jim
100	Fault (UI/Model/Mapping)	15 days	Tue [REDACTED]	Mon [REDACTED]	
101	Initial integration of syslog viewer with devif	5 days	Tue [REDACTED]	Mon [REDACTED]	Jeff
102	Updates for fault UI to support Trapeze specific events	10 days	Tue [REDACTED]	Mon [REDACTED]	
103	Wireless Related	5 days	Tue [REDACTED]	Mon [REDACTED]	Jeff
104	Wired Related	5 days	Tue [REDACTED]	Mon [REDACTED]	Jeff
105	Milestone 3 Unit Tests	12 days	Tue [REDACTED]	Fri [REDACTED]	Yun,Jim,Sudhir,Allan,Jeff,K
106	Alpha Development	57 days	Mon [REDACTED]	Fri [REDACTED]	
107	Custom UI Views	10 days	Mon [REDACTED]	Tue [REDACTED]	Kishan
108	RF Planning Finalize	40 days	Mon [REDACTED]	Wed [REDACTED]	
109	Work Order Generation	7 days	Mon [REDACTED]	Tue [REDACTED]	Sudhir
110	Floor Wizard Changes	5 days	Tue [REDACTED]	Mon [REDACTED]	Sudhir
111	DXF Integration Effort	4 days	Fri [REDACTED]	Wed [REDACTED]	Sudhir
112	RF Verification	26 days	Thu [REDACTED]	Thu [REDACTED]	
113	Dual Homing Support	8 days	Thu [REDACTED]	Mon [REDACTED]	Sudhir
114	Physical Topology Verification	10 days	Fri [REDACTED]	Thu [REDACTED]	Sudhir
115	Rules Implementation	4 days	Thu [REDACTED]	Tue [REDACTED]	Kishan
116	Final Model/Config Updates	26 days	Mon [REDACTED]	Thu [REDACTED]	
117	Fix Event Viewer Bugs	3 days	Mon [REDACTED]	Wed [REDACTED]	Jeff
118	STP Model/UI Rework	5 days	Thu [REDACTED]	Fri [REDACTED]	Jeff
119	Syslog Config/UI Updates	3 days	Mon [REDACTED]	Thu [REDACTED]	Jeff
120	Cluster Management Updates	7 days	Mon [REDACTED]	Thu [REDACTED]	Yun
121	Load Sharing Groups/Port Groups	7 days	Fri [REDACTED]	Tue [REDACTED]	Yun
122	AAA Updates	8 days	Wed [REDACTED]	Fri [REDACTED]	Yun
123	ACL Mapping Updates	5 days	Thu [REDACTED]	Wed [REDACTED]	Kishan
124	AP Config Changes	3 days	Tue [REDACTED]	Thu [REDACTED]	Sudhir
125	Performance UI Updates	10 days	Mon [REDACTED]	Tue [REDACTED]	
126	AP/RF Level	10 days	Mon [REDACTED]	Tue [REDACTED]	Allan
127	CLI/XML Import Mapping Only	10 days	Mon [REDACTED]	Thu [REDACTED]	Jim
128	XML/CLI Export Mapping	10 days	Fri [REDACTED]	Thu [REDACTED]	Jim
129	Client Management Updates	3 days	Mon [REDACTED]	Wed [REDACTED]	

130	Find Client Wizard Updates	3 days	Mon [REDACTED]	Wed [REDACTED]	Yun
131	Device Status Features	10 days	Fri [REDACTED]	Thu [REDACTED]	Jeff
132	Installation	11 days	Wed [REDACTED]	Wed [REDACTED]	
133	Initial Licensing Implementation	8 days	Wed [REDACTED]	Fri [REDACTED]	Kishan
134	Windows XP	3 days	Mon [REDACTED]	Wed [REDACTED]	Kishan
135	Alpha Integration Work	10 days	Mon [REDACTED]	Fri [REDACTED]	Jim,Yun,Jeff,Kishan
136	Alpha QA Support	15 days	Mon [REDACTED]	Fri [REDACTED]	Yun,Jim,Sudhir,Jeff,Kishan
137	Beta Development	50 days	Mon [REDACTED]	Fri [REDACTED]	
138	RF Planning Updates	12 days	Mon [REDACTED]	Tue [REDACTED]	Sudhir
139	DWG Integration Effort	3 days	Wed [REDACTED]	Fri [REDACTED]	Sudhir
140	Mobility Profile/ACL Cleanup	4 days	Mon [REDACTED]	Thu [REDACTED]	Kishan
141					
142	Change Handler Work	5 days	Mon [REDACTED]	Fri [REDACTED]	
143	Infrastructure	2 days	Mon [REDACTED]	Tue [REDACTED]	Jim
144	Mobility Domain	5 days	Mon [REDACTED]	Fri [REDACTED]	Jeff
145	Chassis	1 day	Wed [REDACTED]	Wed [REDACTED]	Jim
146	MP	2 days	Thu [REDACTED]	Fri [REDACTED]	Jim
147					
148	Miscellaneous Changes	12 days	Mon [REDACTED]	Tue [REDACTED]	
149	Refresh From Net Cleanup	3 days	Mon [REDACTED]	Wed [REDACTED]	Jim
150	Proxy Wizard Changes	2 days	Thu [REDACTED]	Fri [REDACTED]	Jim
151	Boot status unhook	1 day	Mon [REDACTED]	Mon [REDACTED]	Jim
152	Distribute Config/Image Updates	1 day	Tue [REDACTED]	Tue [REDACTED]	Jim
153	Run Rules On Upload/Import	1 day	Wed [REDACTED]	Wed [REDACTED]	Jim
154	Inventory Report	4 days	Thu [REDACTED]	Tue [REDACTED]	Jim
155					
156	Client Management Updates	9 days	Mon [REDACTED]	Thu [REDACTED]	
157	Client History	4 days	Mon [REDACTED]	Thu [REDACTED]	Yun
158	Client RF Topology	5 days	Fri [REDACTED]	Thu [REDACTED]	Yun
159					
160	Performance UI Updates	9 days	Wed [REDACTED]	Mon [REDACTED]	
161	RF Aggregation	4 days	Wed [REDACTED]	Mon [REDACTED]	Allan
162	Client Level	5 days	Tue [REDACTED]	Mon [REDACTED]	Allan
163					
164	Priority 1 Print Features	4 days	Tue [REDACTED]	Fri [REDACTED]	
165	Print Spider View	1 day	Tue [REDACTED]	Tue [REDACTED]	Allan
166	Save Stats Table To File	2 days	Wed [REDACTED]	Thu [REDACTED]	Allan
167	Export Event list	1 day	Fri [REDACTED]	Fri [REDACTED]	Allan

168					
169	Final Model/Config Updates	13 days	Mon [REDACTED]	Wed [REDACTED]	
170	Wired Authen Port Updates	5 days	Mon [REDACTED]	Fri [REDACTED]	Jeff
171	Guest VLAN Support	3 days	Fri [REDACTED]	Tue [REDACTED]	Yun
172	SNMP (Reduced Functionality) Config Support	3 days	Mon [REDACTED]	Wed [REDACTED]	Jeff
173	Syslog Updates	2 days	Thu [REDACTED]	Fri [REDACTED]	Jeff
174	Redundant Port Support	3 days	Mon [REDACTED]	Wed [REDACTED]	Jeff
175					
176	Rogue AP Detection	17 days	Fri [REDACTED]	Mon [REDACTED]	
177	Control/Config	5 days	Fri [REDACTED]	Thu [REDACTED]	Kishan
178	Visibility Verification/Display/Monitoring	12 days	Fri [REDACTED]	Mon [REDACTED]	Kishan
179					
180					
181	Beta System Test (includes Optimization/Scaling Work)	25 days	Mon [REDACTED]	Fri [REDACTED]	Yun,Jim,Sudhir,Jeff,Kishan
182					
183					
184	Items That May Be Removed from 1.0	10 days	Tue [REDACTED]	Mon [REDACTED]	
185	WPA/TKIP Config Support	2 days	Tue [REDACTED]	Wed [REDACTED]	Yun
186					
187	Priority 1 Print Features	4 days	Tue [REDACTED]	Fri [REDACTED]	
188	Print Stats Table	1 day	Tue [REDACTED]	Tue [REDACTED]	Allan
189	Print Stats Graph	1 day	Wed [REDACTED]	Wed [REDACTED]	Allan
190	Session Roaming History	1 day	Thu [REDACTED]	Thu [REDACTED]	Allan
191	Floor Layout	1 day	Fri [REDACTED]	Fri [REDACTED]	Allan
192					
193	Priority 2 Print Features	6 days	Tue [REDACTED]	Tue [REDACTED]	
194	Information Panel	2 days	Tue [REDACTED]	Wed [REDACTED]	Jeff
195	RF Detect Layout	1 day	Thu [REDACTED]	Thu [REDACTED]	Jeff
196	Client Location Layout	1 day	Fri [REDACTED]	Fri [REDACTED]	Jeff
197	Client Tracking List	2 days	Mon [REDACTED]	Tue [REDACTED]	Jeff
198					
199	HP Openview Integration	10 days	Tue [REDACTED]	Mon [REDACTED]	
200	Registration Files	4 days	Tue [REDACTED]	Fri [REDACTED]	Kishan
201	Sync Up	6 days	Mon [REDACTED]	Mon [REDACTED]	Kishan
202	HP OV Plugin Installation	3 days	Tue [REDACTED]	Thu [REDACTED]	Allan
203					

204	Installation	5 days	Tue	Mon	
205	Solaris	5 days	Tue	Mon	Allan

Resources

ID	Name	Group	Max Units	Peak Units
1	Yun		100%	100%
2	Jim		100%	100%
3	Charleston		100%	0%
4	TBD		100%	0%
5	Allan		100%	300%
6	Sudhir		100%	100%
7	TBH		100%	0%
8	Jeff Marshall		100%	0%
9	Jeff		100%	100%
10	Kishan ^		100%	100%

Assignments

Task ID	Task Name	Resource Name	Work	Start	Finish	% Work Compl
3	Learning Curve	Sudhir	40 hrs	Mon	Fri	100
6	XML Mapping For Device	Yun	8 hrs	Mon	Mon	100
7	Save Plan	Yun	24 hrs	Tue	Thu	100
8	Open Plan	Yun	16 hrs	Fri	Mon	100
9	Delete Plan	Yun	8 hrs	Tue	Tue	100
10	Object Model/Transactions	Jim	40 hrs	Mon	Tue	100
11	DP Simulator Changes	Jim	24 hrs	Wed	Fri	100
12	Network IO	Jim	72 hrs	Mon	Mon	100
14	New Plan	Charleston	40 hrs	Mon	Fri	100
15	Open Plan	Charleston	16 hrs	Mon	Tue	100
16	Save Plan	Charleston	16 hrs	Wed	Thu	100
17	Save As Plan	Charleston	8 hrs	Fri	Fri	100
18	Delete Plan	Charleston	16 hrs	Mon	Tue	100
19	Basic Wizard Updates	Allan	24 hrs	Mon	Wed	100
20	Revert	Allan	16 hrs	Thu	Fri	100
21	Deploy	Allan	40 hrs	Mon	Fri	100

22	View Layouts and UI Navigation	Charleston	80 hrs	Mon [REDACTED]	Tue [REDACTED]	100
22	View Layouts and UI Navigation	Sudhir	80 hrs	Mon [REDACTED]	Tue [REDACTED]	100
24	Basic Device and Ports	Yun	96 hrs	Wed [REDACTED]	Mon [REDACTED]	100
25	Device VLAN	Sudhir	80 hrs	Mon [REDACTED]	Fri [REDACTED]	100
27	Config Rules	Allan	40 hrs	Mon [REDACTED]	Fri [REDACTED]	100
28	Milestone 1 Unit Tests	Yun	40 hrs	Mon [REDACTED]	Fri [REDACTED]	100
28	Milestone 1 Unit Tests	Jim	40 hrs	Mon [REDACTED]	Fri [REDACTED]	100
28	Milestone 1 Unit Tests	Charleston	40 hrs	Mon [REDACTED]	Fri [REDACTED]	100
28	Milestone 1 Unit Tests	Allan	40 hrs	Mon [REDACTED]	Fri [REDACTED]	100
28	Milestone 1 Unit Tests	Sudhir	40 hrs	Mon [REDACTED]	Fri [REDACTED]	100
31	AAA	Yun	48 hrs	Wed [REDACTED]	Wed [REDACTED]	100
32	Dot1x	Yun	64 hrs	Thu [REDACTED]	Mon [REDACTED]	100
33	IP Aliasing Support	Kishan	16 hrs	Fri [REDACTED]	Mon [REDACTED]	100
35	RF Planning Design	Sudhir	56 hrs	Mon [REDACTED]	Tue [REDACTED]	100
36	Model Definition + Persistence	Sudhir	40 hrs	Wed [REDACTED]	Tue [REDACTED]	100
37	Floor Wizard (Skeleton)	Sudhir	40 hrs	Wed [REDACTED]	Tue [REDACTED]	100
38	Area Wizard	Sudhir	16 hrs	Wed [REDACTED]	Thu [REDACTED]	100
39	Network Design Operation Wizard	Sudhir	40 hrs	Fri [REDACTED]	Thu [REDACTED]	100
40	Add New Obstacle and Loss Assignments	Sudhir	24 hrs	Fri [REDACTED]	Wed [REDACTED]	100
41	Network Design - Finalize Algorithm	Sudhir	40 hrs	Thu [REDACTED]	Wed [REDACTED]	100
42	Network Design - Algorithm Implementation	Sudhir	64 hrs	Thu [REDACTED]	Mon [REDACTED]	100
43	Calculation and Display of Coverage	Sudhir	40 hrs	Tue [REDACTED]	Mon [REDACTED]	100
45	Net IO Infrastructure Updates	Jim	80 hrs	Mon [REDACTED]	Fri [REDACTED]	100
46	UI Infrastructure Updates for Perf	Allan	24 hrs	Mon [REDACTED]	Wed [REDACTED]	100
47	Port Level	Allan	64 hrs	Thu [REDACTED]	Mon [REDACTED]	100
48	Chassis Level	Allan	64 hrs	Tue [REDACTED]	Thu [REDACTED]	100
50	Client Design	Yun	40 hrs	Tue [REDACTED]	Mon [REDACTED]	100
52	Cluster Model	Yun	16 hrs	Tue [REDACTED]	Wed [REDACTED]	100
53	Mapper Support	Yun	8 hrs	Mon [REDACTED]	Mon [REDACTED]	100
54	Device Interface Support	Jim	16 hrs	Tue [REDACTED]	Wed [REDACTED]	100
55	View Layout Changes	Yun	16 hrs	Thu [REDACTED]	Fri [REDACTED]	100
56	Cluster Sync Logic	Jim	32 hrs	Thu [REDACTED]	Wed [REDACTED]	100

57	Summary GUI Page	Yun	16 hrs	Tue [REDACTED]	Wed [REDACTED]	100
58	Find Client Wizard	Yun	24 hrs	Thu [REDACTED]	Mon [REDACTED]	100
60	Simulate Clusters	Jim	8 hrs	Thu [REDACTED]	Thu [REDACTED]	100
61	Implement Client Queries	Jim	24 hrs	Fri [REDACTED]	Tue [REDACTED]	100
62	Integration with embedded DP Simulator	Jim	112 hrs	Wed [REDACTED]	Mon [REDACTED]	100
64	Design	Yun	32 hrs	Wed [REDACTED]	Mon [REDACTED]	100
64	Design	Jim	8 hrs	Wed [REDACTED]	Wed [REDACTED]	100
65	Jeff Learning Curve	Jeff	40 hrs	Tue [REDACTED]	Mon [REDACTED]	100
66	Spanning Tree Model/Mapping/UI	Jeff	88 hrs	Tue [REDACTED]	Tue [REDACTED]	100
67	Security Admin (UI/Persistence)	Jeff	32 hrs	Wed [REDACTED]	Mon [REDACTED]	100
68	Kishan Learning Curve	Kishan	32 hrs	Mon [REDACTED]	Thu [REDACTED]	100
69	Milestone 2 Unit Tests	Yun	80 hrs	Tue [REDACTED]	Mon [REDACTED]	100
69	Milestone 2 Unit Tests	Sudhir	80 hrs	Tue [REDACTED]	Mon [REDACTED]	100
69	Milestone 2 Unit Tests	Jim	80 hrs	Tue [REDACTED]	Mon [REDACTED]	100
69	Milestone 2 Unit Tests	Jeff	80 hrs	Tue [REDACTED]	Mon [REDACTED]	100
69	Milestone 2 Unit Tests	Kishan	80 hrs	Tue [REDACTED]	Mon [REDACTED]	100
71	Training	Sudhir	16 hrs	Tue [REDACTED]	Wed [REDACTED]	100
73	Integrate Apply/Sync Menu Actions into Single Action and Wizard	Allan	40 hrs	Tue [REDACTED]	Mon [REDACTED]	100
74	Resolve Policy Sync Issues in other functions	Allan	24 hrs	Tue [REDACTED]	Thu [REDACTED]	100
76	ISL Config	Jeff	16 hrs	Tue [REDACTED]	Wed [REDACTED]	100
77	NTP Config	Jeff	16 hrs	Thu [REDACTED]	Fri [REDACTED]	100
78	DNS Client	Jeff	16 hrs	Mon [REDACTED]	Tue [REDACTED]	100
79	Logging Config	Jeff	24 hrs	Wed [REDACTED]	Fri [REDACTED]	100
80	HTTP Config	Jeff	16 hrs	Mon [REDACTED]	Tue [REDACTED]	100
81	ACL	Kishan	56 hrs	Thu [REDACTED]	Fri [REDACTED]	100
82	IGMP Snooping	Allan	32 hrs	Tue [REDACTED]	Fri [REDACTED]	100
83	VLAN Updates	Sudhir	32 hrs	Thu [REDACTED]	Tue [REDACTED]	100
84	RF Planning Updates	Sudhir	192 hrs	Wed [REDACTED]	Mon [REDACTED]	100
86	Initial NetIO API Implementation	Jim	40 hrs	Tue [REDACTED]	Tue [REDACTED]	100
87	Net IO Updates for versioning (Cfg/Image/Bootrom Push, Cfg Pull)	Jim	24 hrs	Wed [REDACTED]	Fri [REDACTED]	100
88	Config File Push	Jim	40 hrs	Mon [REDACTED]	Fri [REDACTED]	100
89	Initial UI Implementation	Yun	40 hrs	Tue [REDACTED]	Mon [REDACTED]	100

90	Version Management UI	Yun	64 hrs	Tue [REDACTED]	Thu [REDACTED]	10
91	Image Push	Yun	40 hrs	Fri [REDACTED]	Thu [REDACTED]	10
92	Image Parsing	Yun	48 hrs	Fri [REDACTED]	Fri [REDACTED]	10
93	Jumpad API (Initial Development)	Allan	40 hrs	Fri [REDACTED]	Thu [REDACTED]	10
94	Jumpad API Complete	Allan	40 hrs	Fri [REDACTED]	Thu [REDACTED]	10
96	Rule System Design Updates	Kishan	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
97	Rule System Implementation	Kishan	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
98	Certificate Handling for DP Comms	Jim	16 hrs	Mon [REDACTED]	Tue [REDACTED]	10
99	Boot status display in UI	Jim	8 hrs	Wed [REDACTED]	Wed [REDACTED]	10
101	Initial integration of syslog viewer with devif	Jeff	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10
103	Wireless Related	Jeff	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10
104	Wired Related	Jeff	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10
105	Milestone 3 Unit Tests	Yun	56 hrs	Tue [REDACTED]	Fri [REDACTED]	10
105	Milestone 3 Unit Tests	Jim	80 hrs	Tue [REDACTED]	Wed [REDACTED]	10
105	Milestone 3 Unit Tests	Sudhir	80 hrs	Tue [REDACTED]	Wed [REDACTED]	10
105	Milestone 3 Unit Tests	Allan	80 hrs	Tue [REDACTED]	Wed [REDACTED]	10
105	Milestone 3 Unit Tests	Jeff	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
105	Milestone 3 Unit Tests	Kishan	80 hrs	Tue [REDACTED]	Wed [REDACTED]	10
107	Custom UI Views	Kishan	80 hrs	Mon [REDACTED]	Tue [REDACTED]	10
109	Work Order Generation	Sudhir	56 hrs	Mon [REDACTED]	Tue [REDACTED]	10
110	Floor Wizard Changes	Sudhir	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10
111	DXF Integration Effort	Sudhir	32 hrs	Fri [REDACTED]	Wed [REDACTED]	10
113	Dual Homing Support	Sudhir	64 hrs	Thu [REDACTED]	Mon [REDACTED]	10
114	Physical Topology Verification	Sudhir	80 hrs	Fri [REDACTED]	Thu [REDACTED]	10
115	Rules Implementation	Kishan	32 hrs	Thu [REDACTED]	Tue [REDACTED]	10
117	Fix Event Viewer Bugs	Jeff	24 hrs	Mon [REDACTED]	Wed [REDACTED]	10
118	STP Model/UI Rework	Jeff	40 hrs	Thu [REDACTED]	Fri [REDACTED]	10
119	Syslog Config/UI Updates	Jeff	24 hrs	Mon [REDACTED]	Thu [REDACTED]	10
120	Cluster Management Updates	Yun	56 hrs	Mon [REDACTED]	Thu [REDACTED]	10
121	Load Sharing Groups/Port Groups	Yun	56 hrs	Fri [REDACTED]	Tue [REDACTED]	10
122	AAA Updates	Yun	64 hrs	Wed [REDACTED]	Fri [REDACTED]	10
123	ACL Mapping Updates	Kishan	40 hrs	Thu [REDACTED]	Wed [REDACTED]	10
124	AP Config Changes	Sudhir	24 hrs	Tue [REDACTED]	Thu [REDACTED]	10
126	AP/RF Level	Allan	80 hrs	Mon [REDACTED]	Tue [REDACTED]	10
127	CLI/XML Import Mapping Only	Jim	80 hrs	Mon [REDACTED]	Thu [REDACTED]	10

128	XML/CLI Export Mapping	Jim	80 hrs	Fri [REDACTED]	Thu [REDACTED]	10
130	Find Client Wizard Updates	Yun	24 hrs	Mon [REDACTED]	Wed [REDACTED]	10
131	Device Status Features	Jeff	80 hrs	Fri [REDACTED]	Thu [REDACTED]	10
133	Initial Licensing Implementation	Kishan	64 hrs	Wed [REDACTED]	Fri [REDACTED]	10
134	Windows XP	Kishan	24 hrs	Mon [REDACTED]	Wed [REDACTED]	10
135	Alpha Integration Work	Jim	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
135	Alpha Integration Work	Yun	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
135	Alpha Integration Work	Jeff	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
135	Alpha Integration Work	Kishan	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
136	Alpha QA Support	Yun	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
136	Alpha QA Support	Jim	72 hrs	Mon [REDACTED]	Thu [REDACTED]	10
136	Alpha QA Support	Sudhir	56 hrs	Mon [REDACTED]	Tue [REDACTED]	10
136	Alpha QA Support	Jeff	120 hrs	Mon [REDACTED]	Fri [REDACTED]	10
136	Alpha QA Support	Kishan	72 hrs	Mon [REDACTED]	Fri [REDACTED]	10
138	RF Planning Updates	Sudhir	96 hrs	Mon [REDACTED]	Tue [REDACTED]	7
139	DWG Integration Effort	Sudhir	24 hrs	Wed [REDACTED]	Fri [REDACTED]	7
140	Mobility Profile/ACL Cleanup	Kishan	32 hrs	Mon [REDACTED]	Thu [REDACTED]	10
143	Infrastructure	Jim	16 hrs	Mon [REDACTED]	Tue [REDACTED]	10
144	Mobility Domain	Jeff	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
145	Chassis	Jim	8 hrs	Wed [REDACTED]	Wed [REDACTED]	10
146	MP	Jim	16 hrs	Thu [REDACTED]	Fri [REDACTED]	10
149	Refresh From Net Cleanup	Jim	24 hrs	Mon [REDACTED]	Wed [REDACTED]	10
150	Proxy Wizard Changes	Jim	16 hrs	Thu [REDACTED]	Fri [REDACTED]	10
151	Boot status unhook	Jim	8 hrs	Mon [REDACTED]	Mon [REDACTED]	10
152	Distribute Config/Image Updates	Jim	8 hrs	Tue [REDACTED]	Tue [REDACTED]	10
153	Run Rules On Upload/Import	Jim	8 hrs	Wed [REDACTED]	Wed [REDACTED]	10
154	Inventory Report	Jim	32 hrs	Thu [REDACTED]	Tue [REDACTED]	0
157	Client History	Yun	32 hrs	Mon [REDACTED]	Thu [REDACTED]	10
158	Client RF Topology	Yun	40 hrs	Fri [REDACTED]	Thu [REDACTED]	20
161	RF Aggregation	Allan	32 hrs	Wed [REDACTED]	Mon [REDACTED]	90
162	Client Level	Allan	40 hrs	Tue [REDACTED]	Mon [REDACTED]	90
165	Print Spider View	Allan	8 hrs	Tue [REDACTED]	Tue [REDACTED]	100
166	Save Stats Table To File	Allan	16 hrs	Wed [REDACTED]	Thu [REDACTED]	100
167	Export Event list	Allan	8 hrs	Fri [REDACTED]	Fri [REDACTED]	100
170	Wired Authen Port Updates	Jeff	40 hrs	Mon [REDACTED]	Fri [REDACTED]	100
171	Guest VLAN Support	Yun	24 hrs	Fri [REDACTED]	Tue [REDACTED]	0
172	SNMP (Reduced Functionality)	Jeff	24 hrs	Mon [REDACTED]	Wed [REDACTED]	0

	Config Support					
173	Syslog Updates	Jeff	16 hrs	Thu [REDACTED]	Fri [REDACTED]	
174	Redundant Port Support	Jeff	24 hrs	Mon [REDACTED]	Wed [REDACTED]	
177	Control/Config	Kishan	40 hrs	Fri [REDACTED]	Thu [REDACTED]	10
178	Visibility Verification/Display/Monitoring	Kishan	96 hrs	Fri [REDACTED]	Mon [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Yun	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Jim	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Sudhir	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Jeff	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Kishan	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
185	WPA/TKIP Config Support	Yun	16 hrs	Tue [REDACTED]	Wed [REDACTED]	
188	Print Stats Table	Allan	8 hrs	Tue [REDACTED]	Tue [REDACTED]	
189	Print Stats Graph	Allan	8 hrs	Wed [REDACTED]	Wed [REDACTED]	
190	Session Roaming History	Allan	8 hrs	Thu [REDACTED]	Thu [REDACTED]	
191	Floor Layout	Allan	8 hrs	Fri [REDACTED]	Fri [REDACTED]	
194	Information Panel	Jeff	16 hrs	Tue [REDACTED]	Wed [REDACTED]	
195	RF Detect Layout	Jeff	8 hrs	Thu [REDACTED]	Thu [REDACTED]	
196	Client Location Layout	Jeff	8 hrs	Fri [REDACTED]	Fri [REDACTED]	
197	Client Tracking List	Jeff	16 hrs	Mon [REDACTED]	Tue [REDACTED]	
200	Registration Files	Kishan	32 hrs	Tue [REDACTED]	Fri [REDACTED]	
201	Sync Up	Kishan	48 hrs	Mon [REDACTED]	Mon [REDACTED]	
202	HP OV Plugin Installation	Allan	24 hrs	Tue [REDACTED]	Thu [REDACTED]	
205	Solaris	Allan	40 hrs	Tue [REDACTED]	Mon [REDACTED]	

Exhibit C

Diligence

nms-schedule

Project Start: Mon [REDACTED]
Project Finish: Mon [REDACTED]

Tasks

ID	Task Name	Duration	Start	Finish	Resource Names
1	Implementation	237 days	Mon [REDACTED]	Fri [REDACTED]	
2	Milestone 1 (Basic Workflow)	33 days	Mon [REDACTED]	Fri [REDACTED]	
3	Learning Curve	5 days	Mon [REDACTED]	Fri [REDACTED]	Sudhir
4	Infrastructure Work	25 days	Mon [REDACTED]	Tue [REDACTED]	
5	Persistence	7 days	Mon [REDACTED]	Tue [REDACTED]	
6	XML Mapping For Device	1 day	Mon [REDACTED]	Mon [REDACTED]	Yun
7	Save Plan	3 days	Tue [REDACTED]	Thu [REDACTED]	Yun
8	Open Plan	2 days	Fri [REDACTED]	Mon [REDACTED]	Yun
9	Delete Plan	1 day	Tue [REDACTED]	Tue [REDACTED]	Yun
10	Object Model/Transactions	5 days	Mon [REDACTED]	Tue [REDACTED]	Jim
11	DP Simulator Changes	3 days	Wed [REDACTED]	Fri [REDACTED]	Jim
12	Network IO	9 days	Mon [REDACTED]	Mon [REDACTED]	Jim
13	UI	25 days	Mon [REDACTED]	Tue [REDACTED]	
14	New Plan	5 days	Mon [REDACTED]	Fri [REDACTED]	Charleston
15	Open Plan	2 days	Mon [REDACTED]	Tue [REDACTED]	Charleston
16	Save Plan	2 days	Wed [REDACTED]	Thu [REDACTED]	Charleston
17	Save As Plan	1 day	Fri [REDACTED]	Fri [REDACTED]	Charleston
18	Delete Plan	2 days	Mon [REDACTED]	Tue [REDACTED]	Charleston
19	Basic Wizard Updates	3 days	Mon [REDACTED]	Wed [REDACTED]	Allan
20	Revert	2 days	Thu [REDACTED]	Fri [REDACTED]	Allan
21	Deploy	5 days	Mon [REDACTED]	Fri [REDACTED]	Allan
22	View Layouts and UI Navigation	10 days	Mon [REDACTED]	Tue [REDACTED]	Charleston,Sudhir
23	Basic Config Model (Mapping/Model/UI)	14 days	Mon [REDACTED]	Mon [REDACTED]	
24	Basic Device and Ports	12 days	Wed [REDACTED]	Mon [REDACTED]	Yun

25	Device VLAN	10 days	Mon [REDACTED]	Fri [REDACTED]	Sudhir
26	Basic Verification	5 days	Mon [REDACTED]	Fri [REDACTED]	
27	Config Rules	5 days	Mon [REDACTED]	Fri [REDACTED]	Allan
28	Milestone 1 Unit Tests	5 days	Mon [REDACTED]	Fri [REDACTED]	Yun,Jim,Charleston,Allan
29	Milestone 2 (Config Rev2, Client and Performance)	55 days	Mon [REDACTED]	Mon [REDACTED]	
30	Config Model Updates (Mapping/Model/UI)	43 days	Wed [REDACTED]	Mon [REDACTED]	
31	AAA	6 days	Wed [REDACTED]	Wed [REDACTED]	Yun
32	Dot1x	8 days	Thu [REDACTED]	Mon [REDACTED]	Yun
33	IP Aliasing Support	2 days	Fri [REDACTED]	Mon [REDACTED]	Kishan
34	RF Planning	45 days	Mon [REDACTED]	Mon [REDACTED]	
35	RF Planning Design	7 days	Mon [REDACTED]	Tue [REDACTED]	Sudhir
36	Model Definition + Persistence	5 days	Wed [REDACTED]	Tue [REDACTED]	Sudhir
37	Floor Wizard (Skeleton)	5 days	Wed [REDACTED]	Tue [REDACTED]	Sudhir
38	Area Wizard	2 days	Wed [REDACTED]	Thu [REDACTED]	Sudhir
39	Network Design Operation Wizard	5 days	Fri [REDACTED]	Thu [REDACTED]	Sudhir
40	Add New Obstacle and Loss Assignments	3 days	Fri [REDACTED]	Wed [REDACTED]	Sudhir
41	Network Design - Finalize Algorithm	5 days	Thu [REDACTED]	Wed [REDACTED]	Sudhir
42	Network Design - Algorithm Implementation	8 days	Thu [REDACTED]	Mon [REDACTED]	Sudhir
43	Calculation and Display of Coverage	5 days	Tue [REDACTED]	Mon [REDACTED]	Sudhir
44	Performance (UI/Model/Mapping)	19 days	Mon [REDACTED]	Thu [REDACTED]	
45	Net IO Infrastructure Updates	10 days	Mon [REDACTED]	Fri [REDACTED]	Jim
46	UI Infrastructure Updates for Perf	3 days	Mon [REDACTED]	Wed [REDACTED]	Allan
47	Port Level	8 days	Thu [REDACTED]	Mon [REDACTED]	Allan
48	Chassis Level	8 days	Tue [REDACTED]	Thu [REDACTED]	Allan
49	Client	15 days	Tue [REDACTED]	Tue [REDACTED]	
50	Client Design	5 days	Tue [REDACTED]	Mon [REDACTED]	Yun
51	Cluster Config Changes	5 days	Mon [REDACTED]	Fri [REDACTED]	
52	Cluster Model	2 days	Tue [REDACTED]	Wed [REDACTED]	Yun
53	Mapper Support	1 day	Mon [REDACTED]	Mon [REDACTED]	Yun
54	Device Interface Support	2 days	Tue [REDACTED]	Wed [REDACTED]	Jim
55	View Layout Changes	2 days	Thu [REDACTED]	Fri [REDACTED]	Yun
56	Cluster Sync Logic	4 days	Thu [REDACTED]	Wed [REDACTED]	Jim
57	Summary GUI Page	2 days	Tue [REDACTED]	Wed [REDACTED]	Yun
58	Find Client Wizard	3 days	Thu [REDACTED]	Mon [REDACTED]	Yun

59	Network IO Integration	4 days	Thu [REDACTED]	Tue [REDACTED]	
60	Simulate Clusters	1 day	Thu [REDACTED]	Thu [REDACTED]	Jim
61	Implement Client Queries	3 days	Fri [REDACTED]	Tue [REDACTED]	Jim
62	Integration with embedded DP Simulator	14 days	Wed [REDACTED]	Mon [REDACTED]	Jim
63	Config/Image Management (Initial)	4 days	Wed [REDACTED]	Mon [REDACTED]	
64	Design	4 days	Wed [REDACTED]	Mon [REDACTED]	Yun,Jim
65	Jeff Learning Curve	5 days	Tue [REDACTED]	Mon [REDACTED]	Jeff
66	Spanning Tree Model/Mapping/UI	11 days	Tue [REDACTED]	Tue [REDACTED]	Jeff
67	Security Admin (UI/Persistence)	4 days	Wed [REDACTED]	Mon [REDACTED]	Jeff
68	Kishan Learning Curve	4 days	Mon [REDACTED]	Thu [REDACTED]	Kishan
69	Milestone 2 Unit Tests	10 days	Tue [REDACTED]	Mon [REDACTED]	Yun,Sudhir,Jim,Jeff,Kisha
70	Milestone 3 (Verify/Fault/ConfigVersion/Reports)	42 days	Tue [REDACTED]	Fri [REDACTED]	
71	Training	2 days	Tue [REDACTED]	Wed [REDACTED]	Sudhir
72	Policy Updates	8 days	Tue [REDACTED]	Thu [REDACTED]	
73	Integrate Apply/Sync Menu Actions into Single Action and Wizard	5 days	Tue [REDACTED]	Mon [REDACTED]	Allan
74	Resolve Policy Sync Issues in other functions	3 days	Tue [REDACTED]	Thu [REDACTED]	Allan
75	Config Model Updates	14 days	Tue [REDACTED]	Fri [REDACTED]	
76	ISL Config	2 days	Tue [REDACTED]	Wed [REDACTED]	Jeff
77	NTP Config	2 days	Thu [REDACTED]	Fri [REDACTED]	Jeff
78	DNS Client	2 days	Mon [REDACTED]	Tue [REDACTED]	Jeff
79	Logging Config	3 days	Wed [REDACTED]	Fri [REDACTED]	Jeff
80	HTTP Config	2 days	Mon [REDACTED]	Tue [REDACTED]	Jeff
81	ACL	7 days	Thu [REDACTED]	Fri [REDACTED]	Kishan
82	IGMP Snooping	4 days	Tue [REDACTED]	Fri [REDACTED]	Allan
83	VLAN Updates	4 days	Thu [REDACTED]	Tue [REDACTED]	Sudhir
84	RF Planning Updates	24 days	Wed [REDACTED]	Mon [REDACTED]	Sudhir
85	Config/Image Management	24 days	Tue [REDACTED]	Fri [REDACTED]	
86	Initial NetIO API Implementation	5 days	Tue [REDACTED]	Tue [REDACTED]	Jim
87	Net IO Updates for versioning (Cfg/Image/Bootrom Push, Cfg Pull)	3 days	Wed [REDACTED]	Fri [REDACTED]	Jim
88	Config File Push	5 days	Mon [REDACTED]	Fri [REDACTED]	Jim
89	Initial UI Implementation	5 days	Tue [REDACTED]	Mon [REDACTED]	Yun
90	Version Management UI	8 days	Tue [REDACTED]	Thu [REDACTED]	Yun
91	Image Push	5 days	Fri [REDACTED]	Thu [REDACTED]	Yun
92	Image Parsing	6 days	Fri [REDACTED]	Fri [REDACTED]	Yun

93	Jumppad API (Initial Development)	5 days	Fri [REDACTED]	Thu [REDACTED]	Allan
94	Jumppad API Complete	5 days	Fri [REDACTED]	Thu [REDACTED]	Allan
95	Verification Updates	15 days	Mon [REDACTED]	Fri [REDACTED]	
96	Rule System Design Updates	5 days	Mon [REDACTED]	Fri [REDACTED]	Kishan
97	Rule System Implementation	10 days	Mon [REDACTED]	Fri [REDACTED]	Kishan
98	Certificate Handling for DP Comms	2 days	Mon [REDACTED]	Tue [REDACTED]	Jim
99	Boot status display in UI	1 day	Wed [REDACTED]	Wed [REDACTED]	Jim
100	Fault (UI/Model/Mapping)	15 days	Tue [REDACTED]	Mon [REDACTED]	
101	Initial integration of syslog viewer with devif	5 days	Tue [REDACTED]	Mon [REDACTED]	Jeff
102	Updates for fault UI to support Trapeze specific events	10 days	Tue [REDACTED]	Mon [REDACTED]	
103	Wireless Related	5 days	Tue [REDACTED]	Mon [REDACTED]	Jeff
104	Wired Related	5 days	Tue [REDACTED]	Mon [REDACTED]	Jeff
105	Milestone 3 Unit Tests	12 days	Tue [REDACTED]	Fri [REDACTED]	Yun,Jim,Sudhir,Allan,Jeff,
106	Alpha Development	57 days	Mon [REDACTED]	Fri [REDACTED]	
107	Custom UI Views	10 days	Mon [REDACTED]	Tue [REDACTED]	Kishan
108	RF Planning Finalize	40 days	Mon [REDACTED]	Wed [REDACTED]	
109	Work Order Generation	7 days	Mon [REDACTED]	Tue [REDACTED]	Sudhir
110	Floor Wizard Changes	5 days	Tue [REDACTED]	Mon [REDACTED]	Sudhir
111	DXF Integration Effort	4 days	Fri [REDACTED]	Wed [REDACTED]	Sudhir
112	RF Verification	26 days	Thu [REDACTED]	Thu [REDACTED]	
113	Dual Homing Support	8 days	Thu [REDACTED]	Mon [REDACTED]	Sudhir
114	Physical Topology Verification	10 days	Fri [REDACTED]	Thu [REDACTED]	Sudhir
115	Rules Implementation	4 days	Thu [REDACTED]	Tue [REDACTED]	Kishan
116	Final Model/Config Updates	26 days	Mon [REDACTED]	Thu [REDACTED]	
117	Fix Event Viewer Bugs	3 days	Mon [REDACTED]	Wed [REDACTED]	Jeff
118	STP Model/UI Rework	5 days	Thu [REDACTED]	Fri [REDACTED]	Jeff
119	Syslog Config/UI Updates	3 days	Mon [REDACTED]	Thu [REDACTED]	Jeff
120	Cluster Management Updates	7 days	Mon [REDACTED]	Thu [REDACTED]	Yun
121	Load Sharing Groups/Port Groups	7 days	Fri [REDACTED]	Tue [REDACTED]	Yun
122	AAA Updates	8 days	Wed [REDACTED]	Fri [REDACTED]	Yun
123	ACL Mapping Updates	5 days	Thu [REDACTED]	Wed [REDACTED]	Kishan
124	AP Config Changes	3 days	Tue [REDACTED]	Thu [REDACTED]	Sudhir
125	Performance UI Updates	10 days	Mon [REDACTED]	Tue [REDACTED]	
126	AP/RF Level	10 days	Mon [REDACTED]	Tue [REDACTED]	Allan
127	CLI/XML Import Mapping Only	10 days	Mon [REDACTED]	Thu [REDACTED]	Jim
128	XML/CLI Export Mapping	10 days	Fri [REDACTED]	Thu [REDACTED]	Jim
129	Client Management Updates	3 days	Mon [REDACTED]	Wed [REDACTED]	

130	Find Client Wizard Updates	3 days	Mon [REDACTED]	Wed [REDACTED]	Yun
131	Device Status Features	10 days	Fri [REDACTED]	Thu [REDACTED]	Jeff
132	Installation	11 days	Wed [REDACTED]	Wed [REDACTED]	
133	Initial Licensing Implementation	8 days	Wed [REDACTED]	Fri [REDACTED]	Kishan
134	Windows XP	3 days	Mon [REDACTED]	Wed [REDACTED]	Kishan
135	Alpha Integration Work	10 days	Mon [REDACTED]	Fri [REDACTED]	Jim, Yun, Jeff, Kishan
136	Alpha QA Support	15 days	Mon [REDACTED]	Fri [REDACTED]	Yun, Jim, Sudhir, Jeff, Kishan
137	Beta Development	50 days	Mon [REDACTED]	Fri [REDACTED]	
138	RF Planning Updates	12 days	Mon [REDACTED]	Tue [REDACTED]	Sudhir
139	DWG Integration Effort	3 days	Wed [REDACTED]	Fri [REDACTED]	Sudhir
140	Mobility Profile/ACL Cleanup	4 days	Mon [REDACTED]	Thu [REDACTED]	Kishan
141					
142	Change Handler Work	5 days	Mon [REDACTED]	Fri [REDACTED]	
143	Infrastructure	2 days	Mon [REDACTED]	Tue [REDACTED]	Jim
144	Mobility Domain	5 days	Mon [REDACTED]	Fri [REDACTED]	Jeff
145	Chassis	1 day	Wed [REDACTED]	Wed [REDACTED]	Jim
146	MP	2 days	Thu [REDACTED]	Fri [REDACTED]	Jim
147					
148	Miscellaneous Changes	12 days	Mon [REDACTED]	Tue [REDACTED]	
149	Refresh From Net Cleanup	3 days	Mon [REDACTED]	Wed [REDACTED]	Jim
150	Proxy Wizard Changes	2 days	Thu [REDACTED]	Fri [REDACTED]	Jim
151	Boot status unhook	1 day	Mon [REDACTED]	Mon [REDACTED]	Jim
152	Distribute Config/Image Updates	1 day	Tue [REDACTED]	Tue [REDACTED]	Jim
153	Run Rules On Upload/Import	1 day	Wed [REDACTED]	Wed [REDACTED]	Jim
154	Inventory Report	4 days	Thu [REDACTED]	Tue [REDACTED]	Jim
155					
156	Client Management Updates	9 days	Mon [REDACTED]	Thu [REDACTED]	
157	Client History	4 days	Mon [REDACTED]	Thu [REDACTED]	Yun
158	Client RF Topology	5 days	Fri [REDACTED]	Thu [REDACTED]	Yun
159					
160	Performance UI Updates	9 days	Wed [REDACTED]	Mon [REDACTED]	
161	RF Aggregation	4 days	Wed [REDACTED]	Mon [REDACTED]	Allan
162	Client Level	5 days	Tue [REDACTED]	Mon [REDACTED]	Allan
163					
164	Priority 1 Print Features	4 days	Tue [REDACTED]	Fri [REDACTED]	
165	Print Spider View	1 day	Tue [REDACTED]	Tue [REDACTED]	Allan
166	Save Stats Table To File	2 days	Wed [REDACTED]	Thu [REDACTED]	Allan
167	Export Event list	1 day	Fri [REDACTED]	Fri [REDACTED]	Allan

168					
169	Final Model/Config Updates	13 days	Mon [REDACTED]	Wed [REDACTED]	
170	Wired Authen Port Updates	5 days	Mon [REDACTED]	Fri [REDACTED]	Jeff
171	Guest VLAN Support	3 days	Fri [REDACTED]	Tue [REDACTED]	Yun
172	SNMP (Reduced Functionality) Config Support	3 days	Mon [REDACTED]	Wed [REDACTED]	Jeff
173	Syslog Updates	2 days	Thu [REDACTED]	Fri [REDACTED]	Jeff
174	Redundant Port Support	3 days	Mon [REDACTED]	Wed [REDACTED]	Jeff
175					
176	Rogue AP Detection	17 days	Fri [REDACTED]	Mon [REDACTED]	
177	Control/Config	5 days	Fri [REDACTED]	Thu [REDACTED]	Kishan
178	Visibility Verification/Display/Monitoring	12 days	Fri [REDACTED]	Mon [REDACTED]	Kishan
179					
180					
181	Beta System Test (includes Optimization/Scaling Work)	25 days	Mon [REDACTED]	Fri [REDACTED]	Yun,Jim,Sudhir,Jeff,Kisha
182					
183					
184	Items That May Be Removed from 1.0	10 days	Tue [REDACTED]	Mon [REDACTED]	
185	WPA/TKIP Config Support	2 days	Tue [REDACTED]	Wed [REDACTED]	Yun
186					
187	Priority 1 Print Features	4 days	Tue [REDACTED]	Fri [REDACTED]	
188	Print Stats Table	1 day	Tue [REDACTED]	Tue [REDACTED]	Allan
189	- Print Stats Graph	1 day	Wed [REDACTED]	Wed [REDACTED]	Allan
190	Session Roaming History	1 day	Thu [REDACTED]	Thu [REDACTED]	Allan
191	Floor Layout	1 day	Fri [REDACTED]	Fri [REDACTED]	Allan
192					
193	Priority 2 Print Features	6 days	Tue [REDACTED]	Tue [REDACTED]	
194	Information Panel	2 days	Tue [REDACTED]	Wed [REDACTED]	Jeff
195	RF Detect Layout	1 day	Thu [REDACTED]	Thu [REDACTED]	Jeff
196	Client Location Layout	1 day	Fri [REDACTED]	Fri [REDACTED]	Jeff
197	Client Tracking List	2 days	Mon [REDACTED]	Tue [REDACTED]	Jeff
198					
199	HP Openview Integration	10 days	Tue [REDACTED]	Mon [REDACTED]	
200	Registration Files	4 days	Tue [REDACTED]	Fri [REDACTED]	Kishan
201	Sync Up	6 days	Mon [REDACTED]	Mon [REDACTED]	Kishan
202	HP OV Plugin Installation	3 days	Tue [REDACTED]	Thu [REDACTED]	Allan
203					

204	Installation	5 days	Tue [REDACTED]	Mon [REDACTED]	
205	Solaris	5 days	Tue [REDACTED]	Mon [REDACTED]	Allan

Resources

ID	Name	Group	Max Units	Peak Units
1	Yun		100%	100%
2	Jim		100%	100%
3	Charleston		100%	0%
4	TBD		100%	0%
5	Allan		100%	300%
6	Sudhir		100%	100%
7	TBH		100%	0%
8	Jeff Marshall		100%	0%
9	Jeff		100%	100%
10	Kishan ^		100%	100%

Assignments

Task ID	Task Name	Resource Name	Work	Start	Finish	% Work Comp
3	Learning Curve	Sudhir	40 hrs	Mon	Fri	10
6	XML Mapping For Device	Yun	8 hrs	Mon	Mon	10
7	Save Plan	Yun	24 hrs	Tue	Thu	10
8	Open Plan	Yun	16 hrs	Fri	Mon	10
9	Delete Plan	Yun	8 hrs	Tue	Tue	10
10	Object Model/Transactions	Jim	40 hrs	Mon	Tue	10
11	DP Simulator Changes	Jim	24 hrs	Wed	Fri	10
12	Network IO	Jim	72 hrs	Mon	Mon	10
14	New Plan	Charleston	40 hrs	Mon	Fri	10
15	Open Plan	Charleston	16 hrs	Mon	Tue	10
16	Save Plan	Charleston	16 hrs	Wed	Thu	10
17	Save As Plan	Charleston	8 hrs	Fri	Fri	10
18	Delete Plan	Charleston	16 hrs	Mon	Tue	10
19	Basic Wizard Updates	Allan	24 hrs	Mon	Wed	10
20	Revert	Allan	16 hrs	Thu	Fri	10
21	Deploy	Allan	40 hrs	Mon	Fri	10

22	View Layouts and UI Navigation	Charleston	80 hrs	Mon [REDACTED]	Tue [REDACTED]	10
22	View Layouts and UI Navigation	Sudhir	80 hrs	Mon [REDACTED]	Tue [REDACTED]	10
24	Basic Device and Ports	Yun	96 hrs	Wed [REDACTED]	Mon [REDACTED]	10
25	Device VLAN	Sudhir	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
27	Config Rules	Allan	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
28	Milestone 1 Unit Tests	Yun	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
28	Milestone 1 Unit Tests	Jim	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
28	Milestone 1 Unit Tests	Charleston	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
28	Milestone 1 Unit Tests	Allan	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
28	Milestone 1 Unit Tests	Sudhir	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
31	AAA	Yun	48 hrs	Wed [REDACTED]	Wed [REDACTED]	10
32	Dot1x	Yun	64 hrs	Thu [REDACTED]	Mon [REDACTED]	10
33	IP Aliasing Support	Kishan	16 hrs	Fri [REDACTED]	Mon [REDACTED]	10
35	RF Planning Design	Sudhir	56 hrs	Mon [REDACTED]	Tue [REDACTED]	10
36	Model Definition + Persistence	Sudhir	40 hrs	Wed [REDACTED]	Tue [REDACTED]	10
37	Floor Wizard (Skeleton)	Sudhir	40 hrs	Wed [REDACTED]	Tue [REDACTED]	10
38	Area Wizard	Sudhir	16 hrs	Wed [REDACTED]	Thu [REDACTED]	10
39	Network Design Operation Wizard	Sudhir	40 hrs	Fri [REDACTED]	Thu [REDACTED]	10
40	Add New Obstacle and Loss Assignments	Sudhir	24 hrs	Fri [REDACTED]	Wed [REDACTED]	10
41	Network Design - Finalize Algorithm	Sudhir	40 hrs	Thu [REDACTED]	Wed [REDACTED]	10
42	Network Design - Algorithm Implementation	Sudhir	64 hrs	Thu [REDACTED]	Mon [REDACTED]	10
43	Calculation and Display of Coverage	Sudhir	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10
45	Net IO Infrastructure Updates	Jim	80 hrs	Mon [REDACTED]	Fri [REDACTED]	10
46	UI Infrastructure Updates for Perf	Allan	24 hrs	Mon [REDACTED]	Wed [REDACTED]	10
47	Port Level	Allan	64 hrs	Thu [REDACTED]	Mon [REDACTED]	10
48	Chassis Level	Allan	64 hrs	Tue [REDACTED]	Thu [REDACTED]	10
50	Client Design	Yun	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10
52	Cluster Model	Yun	16 hrs	Tue [REDACTED]	Wed [REDACTED]	10
53	Mapper Support	Yun	8 hrs	Mon [REDACTED]	Mon [REDACTED]	10
54	Device Interface Support	Jim	16 hrs	Tue [REDACTED]	Wed [REDACTED]	10
55	View Layout Changes	Yun	16 hrs	Thu [REDACTED]	Fri [REDACTED]	10
56	Cluster Sync Logic	Jim	32 hrs	Thu [REDACTED]	Wed [REDACTED]	10

57	Summary GUI Page	Yun	16 hrs	Tue [REDACTED]	Wed [REDACTED]	10
58	Find Client Wizard	Yun	24 hrs	Thu [REDACTED]	Mon [REDACTED]	10
60	Simulate Clusters	Jim	8 hrs	Thu [REDACTED]	Thu [REDACTED]	10
61	Implement Client Queries	Jim	24 hrs	Fri [REDACTED]	Tue [REDACTED]	10
62	Integration with embedded DP Simulator	Jim	112 hrs	Wed [REDACTED]	Mon [REDACTED]	10
64	Design	Yun	32 hrs	Wed [REDACTED]	Mon [REDACTED]	10
64	Design	Jim	8 hrs	Wed [REDACTED]	Wed [REDACTED]	10
65	Jeff Learning Curve	Jeff	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10
66	Spanning Tree Model/Mapping/UI	Jeff	88 hrs	Tue [REDACTED]	Tue [REDACTED]	10
67	Security Admin (UI/Persistence)	Jeff	32 hrs	Wed [REDACTED]	Mon [REDACTED]	10
68	Kishan Learning Curve	Kishan	32 hrs	Mon [REDACTED]	Thu [REDACTED]	10
69	Milestone 2 Unit Tests	Yun	80 hrs	Tue [REDACTED]	Mon [REDACTED]	10
69	Milestone 2 Unit Tests	Sudhir	80 hrs	Tue [REDACTED]	Mon [REDACTED]	10
69	Milestone 2 Unit Tests	Jim	80 hrs	Tue [REDACTED]	Mon [REDACTED]	10
69	Milestone 2 Unit Tests	Jeff	80 hrs	Tue [REDACTED]	Mon [REDACTED]	10
69	Milestone 2 Unit Tests	Kishan	80 hrs	Tue [REDACTED]	Mon [REDACTED]	10
71	Training	Sudhir	16 hrs	Tue [REDACTED]	Wed [REDACTED]	10
73	Integrate Apply/Sync Menu Actions into Single Action and Wizard	Allan	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10
74	Resolve Policy Sync Issues in other functions	Allan	24 hrs	Tue [REDACTED]	Thu [REDACTED]	10
76	ISL Config	Jeff	16 hrs	Tue [REDACTED]	Wed [REDACTED]	10
77	NTP Config	Jeff	16 hrs	Thu [REDACTED]	Fri [REDACTED]	10
78	DNS Client	Jeff	16 hrs	Mon [REDACTED]	Tue [REDACTED]	10
79	Logging Config	Jeff	24 hrs	Wed [REDACTED]	Fri [REDACTED]	10
80	HTTP Config	Jeff	16 hrs	Mon [REDACTED]	Tue [REDACTED]	10
81	ACL	Kishan	56 hrs	Thu [REDACTED]	Fri [REDACTED]	10
82	IGMP Snooping	Allan	32 hrs	Tue [REDACTED]	Fri [REDACTED]	10
83	VLAN Updates	Sudhir	32 hrs	Thu [REDACTED]	Tue [REDACTED]	10
84	RF Planning Updates	Sudhir	192 hrs	Wed [REDACTED]	Mon [REDACTED]	10
86	Initial NetIO API Implementation	Jim	40 hrs	Tue [REDACTED]	Tue [REDACTED]	10
87	Net IO Updates for versioning (Cfg/Image/Bootrom Push, Cfg Pull)	Jim	24 hrs	Wed [REDACTED]	Fri [REDACTED]	10
88	Config File Push	Jim	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
89	Initial UI Implementation	Yun	40 hrs	Tue [REDACTED]	Mon [REDACTED]	10

90	Version Management UI	Yun	64 hrs	Tue [REDACTED]	Thu [REDACTED]	1
91	Image Push	Yun	40 hrs	Fri [REDACTED]	Thu [REDACTED]	1
92	Image Parsing	Yun	48 hrs	Fri [REDACTED]	Fri [REDACTED]	1
93	Jumpad API (Initial Development)	Allan	40 hrs	Fri [REDACTED]	Thu [REDACTED]	1
94	Jumpad API Complete	Allan	40 hrs	Fri [REDACTED]	Thu [REDACTED]	1
96	Rule System Design Updates	Kishan	40 hrs	Mon [REDACTED]	Fri [REDACTED]	1
97	Rule System Implementation	Kishan	80 hrs	Mon [REDACTED]	Fri [REDACTED]	1
98	Certificate Handling for DP Comms	Jim	16 hrs	Mon [REDACTED]	Tue [REDACTED]	1
99	Boot status display in UI	Jim	8 hrs	Wed [REDACTED]	Wed [REDACTED]	1
101	Initial integration of syslog viewer with devif	Jeff	40 hrs	Tue [REDACTED]	Mon [REDACTED]	1
103	Wireless Related	Jeff	40 hrs	Tue [REDACTED]	Mon [REDACTED]	1
104	Wired Related	Jeff	40 hrs	Tue [REDACTED]	Mon [REDACTED]	1
105	Milestone 3 Unit Tests	Yun	56 hrs	Tue [REDACTED]	Fri [REDACTED]	1
105	Milestone 3 Unit Tests	Jim	80 hrs	Tue [REDACTED]	Wed [REDACTED]	1
105	Milestone 3 Unit Tests	Sudhir	80 hrs	Tue [REDACTED]	Wed [REDACTED]	1
105	Milestone 3 Unit Tests	Allan	80 hrs	Tue [REDACTED]	Wed [REDACTED]	1
105	Milestone 3 Unit Tests	Jeff	80 hrs	Mon [REDACTED]	Fri [REDACTED]	1
105	Milestone 3 Unit Tests	Kishan	80 hrs	Tue [REDACTED]	Wed [REDACTED]	1
107	Custom UI Views	Kishan	80 hrs	Mon [REDACTED]	Tue [REDACTED]	1
109	Work Order Generation	Sudhir	56 hrs	Mon [REDACTED]	Tue [REDACTED]	1
110	Floor Wizard Changes	Sudhir	40 hrs	Tue [REDACTED]	Mon [REDACTED]	1
111	DXF Integration Effort	Sudhir	32 hrs	Fri [REDACTED]	Wed [REDACTED]	1
113	Dual Homing Support	Sudhir	64 hrs	Thu [REDACTED]	Mon [REDACTED]	1
114	Physical Topology Verification	Sudhir	80 hrs	Fri [REDACTED]	Thu [REDACTED]	1
115	Rules Implementation	Kishan	32 hrs	Thu [REDACTED]	Tue [REDACTED]	1
117	Fix Event Viewer Bugs	Jeff	24 hrs	Mon [REDACTED]	Wed [REDACTED]	1
118	STP Model/UI Rework	Jeff	40 hrs	Thu [REDACTED]	Fri [REDACTED]	1
119	Syslog Config/UI Updates	Jeff	24 hrs	Mon [REDACTED]	Thu [REDACTED]	1
120	Cluster Management Updates	Yun	56 hrs	Mon [REDACTED]	Thu [REDACTED]	1
121	Load Sharing Groups/Port Groups	Yun	56 hrs	Fri [REDACTED]	Tue [REDACTED]	1
122	AAA Updates	Yun	64 hrs	Wed [REDACTED]	Fri [REDACTED]	1
123	ACL Mapping Updates	Kishan	40 hrs	Thu [REDACTED]	Wed [REDACTED]	1
124	AP Config Changes	Sudhir	24 hrs	Tue [REDACTED]	Thu [REDACTED]	1
126	AP/RF Level	Allan	80 hrs	Mon [REDACTED]	Tue [REDACTED]	1
127	CLI/XML Import Mapping Only	Jim	80 hrs	Mon [REDACTED]	Thu [REDACTED]	1

128	XML/CLI Export Mapping	Jim	80 hrs	Fri [REDACTED]	Thu [REDACTED]	1
130	Find Client Wizard Updates	Yun	24 hrs	Mon [REDACTED]	Wed [REDACTED]	1
131	Device Status Features	Jeff	80 hrs	Fri [REDACTED]	Thu [REDACTED]	1
133	Initial Licensing Implementation	Kishan	64 hrs	Wed [REDACTED]	Fri [REDACTED]	1
134	Windows XP	Kishan	24 hrs	Mon [REDACTED]	Wed [REDACTED]	1
135	Alpha Integration Work	Jim	80 hrs	Mon [REDACTED]	Fri [REDACTED]	1
135	Alpha Integration Work	Yun	80 hrs	Mon [REDACTED]	Fri [REDACTED]	1
135	Alpha Integration Work	Jeff	80 hrs	Mon [REDACTED]	Fri [REDACTED]	1
135	Alpha Integration Work	Kishan	80 hrs	Mon [REDACTED]	Fri [REDACTED]	1
136	Alpha QA Support	Yun	80 hrs	Mon [REDACTED]	Fri [REDACTED]	1
136	Alpha QA Support	Jim	72 hrs	Mon [REDACTED]	Thu [REDACTED]	1
136	Alpha QA Support	Sudhir	56 hrs	Mon [REDACTED]	Tue [REDACTED]	1
136	Alpha QA Support	Jeff	120 hrs	Mon [REDACTED]	Fri [REDACTED]	1
136	Alpha QA Support	Kishan	72 hrs	Mon [REDACTED]	Fri [REDACTED]	1
138	RF Planning Updates	Sudhir	96 hrs	Mon [REDACTED]	Tue [REDACTED]	
139	DWG Integration Effort	Sudhir	24 hrs	Wed [REDACTED]	Fri [REDACTED]	
140	Mobility Profile/ACL Cleanup	Kishan	32 hrs	Mon [REDACTED]	Thu [REDACTED]	10
143	Infrastructure	Jim	16 hrs	Mon [REDACTED]	Tue [REDACTED]	10
144	Mobility Domain	Jeff	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
145	Chassis	Jim	8 hrs	Wed [REDACTED]	Wed [REDACTED]	10
146	MP	Jim	16 hrs	Thu [REDACTED]	Fri [REDACTED]	10
149	Refresh From Net Cleanup	Jim	24 hrs	Mon [REDACTED]	Wed [REDACTED]	10
150	Proxy Wizard Changes	Jim	16 hrs	Thu [REDACTED]	Fri [REDACTED]	10
151	Boot status unhook	Jim	8 hrs	Mon [REDACTED]	Mon [REDACTED]	10
152	Distribute Config/Image Updates	Jim	8 hrs	Tue [REDACTED]	Tue [REDACTED]	10
153	Run Rules On Upload/Import	Jim	8 hrs	Wed [REDACTED]	Wed [REDACTED]	10
154	Inventory Report	Jim	32 hrs	Thu [REDACTED]	Tue [REDACTED]	
157	Client History	Yun	32 hrs	Mon [REDACTED]	Thu [REDACTED]	10
158	Client RF Topology	Yun	40 hrs	Fri [REDACTED]	Thu [REDACTED]	2
161	RF Aggregation	Allan	32 hrs	Wed [REDACTED]	Mon [REDACTED]	9
162	Client Level	Allan	40 hrs	Tue [REDACTED]	Mon [REDACTED]	9
165	Print Spider View	Allan	8 hrs	Tue [REDACTED]	Tue [REDACTED]	10
166	Save Stats Table To File	Allan	16 hrs	Wed [REDACTED]	Thu [REDACTED]	10
167	Export Event list	Allan	8 hrs	Fri [REDACTED]	Fri [REDACTED]	10
170	Wired Authen Port Updates	Jeff	40 hrs	Mon [REDACTED]	Fri [REDACTED]	10
171	Guest VLAN Support	Yun	24 hrs	Fri [REDACTED]	Tue [REDACTED]	
172	SNMP (Reduced Functionality)	Jeff	24 hrs	Mon [REDACTED]	Wed [REDACTED]	

	Config Support					
173	Syslog Updates	Jeff	16 hrs	Thu [REDACTED]	Fri [REDACTED]	
174	Redundant Port Support	Jeff	24 hrs	Mon [REDACTED]	Wed [REDACTED]	
177	Control/Config	Kishan	40 hrs	Fri [REDACTED]	Thu [REDACTED]	1
178	Visibility Verification/Display/Monitoring	Kishan	96 hrs	Fri [REDACTED]	Mon [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Yun	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Jim	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Sudhir	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Jeff	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
181	Beta System Test (includes Optimization/Scaling Work)	Kishan	200 hrs	Mon [REDACTED]	Fri [REDACTED]	
185	WPA/TKIP Config Support	Yun	16 hrs	Tue [REDACTED]	Wed [REDACTED]	
188	Print Stats Table	Allan	8 hrs	Tue [REDACTED]	Tue [REDACTED]	
189	Print Stats Graph	Allan	8 hrs	Wed [REDACTED]	Wed [REDACTED]	
190	Session Roaming History	Allan	8 hrs	Thu [REDACTED]	Thu [REDACTED]	
191	Floor Layout	Allan	8 hrs	Fri [REDACTED]	Fri [REDACTED]	
194	Information Panel	Jeff	16 hrs	Tue [REDACTED]	Wed [REDACTED]	
195	RF Detect Layout	Jeff	8 hrs	Thu [REDACTED]	Thu [REDACTED]	
196	Client Location Layout	Jeff	8 hrs	Fri [REDACTED]	Fri [REDACTED]	
197	Client Tracking List	Jeff	16 hrs	Mon [REDACTED]	Tue [REDACTED]	
200	Registration Files	Kishan	32 hrs	Tue [REDACTED]	Fri [REDACTED]	
201	Sync Up	Kishan	48 hrs	Mon [REDACTED]	Mon [REDACTED]	
202	HP OV Plugin Installation	Allan	24 hrs	Tue [REDACTED]	Thu [REDACTED]	
205	Solaris	Allan	40 hrs	Tue [REDACTED]	Mon [REDACTED]	

NMS 1.0 SOFTWARE DESIGN SPECIFICATION

RF PLANNING & VERIFICATION


Revision 0.5



AUTHORS: NMS Engineering Team

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Revision	Who	Date	Description
0.1	Sudhir		First draft
0.2	Sudhir		Added the overview of logic for rf planning and updates of wizards with screen shots
0.3	Sudhir		Added ActiveUsersPct factor to AP_cap calculation
0.4	Sudhir		Added RF Verification Section
0.5	Sudhir		Updated document based on 1.0 functionality

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1 RF PLANNING

1.1 RF PLANNING

This section covers the understanding of Requirements for RF Planning Tool and details the design.

The primary goals of this feature in Jumpad are:

- Ability to create a coverage Area
- Ability to design Wireless network
- Ability to automatically assign channels to different Access points
- Ability to view/edit the generated location of the Access Point and Data Point
- Ability to define obstacles in floor with attenuation factors
- Ability to specify a channel that a foreign Access Point is using (if it is not discovered by AP)
- Ability to deploy the generated configuration and then collect data to show coverage
- Ability to visibly see the difference in deployed network vs. actual coverage information obtained from Access Point
- Ability to visibly see the desired network and the coverage obtained by a “single Access Point failure”
- Ability to show clients on topology map (this will be an on-demand operation)
- Ability to show Rogue Access Points discovered by Trapeze devices and allow the user to select it and mark it as a foreign Access Point
- Ability to track the location of a particular wireless user

1.2 USE CASE SCENARIOS (OUTDATED: PLEASE REFER TO USER MANUAL)

Following diagram depicts the scenarios from a user-point of view

Floor Wizard Overview

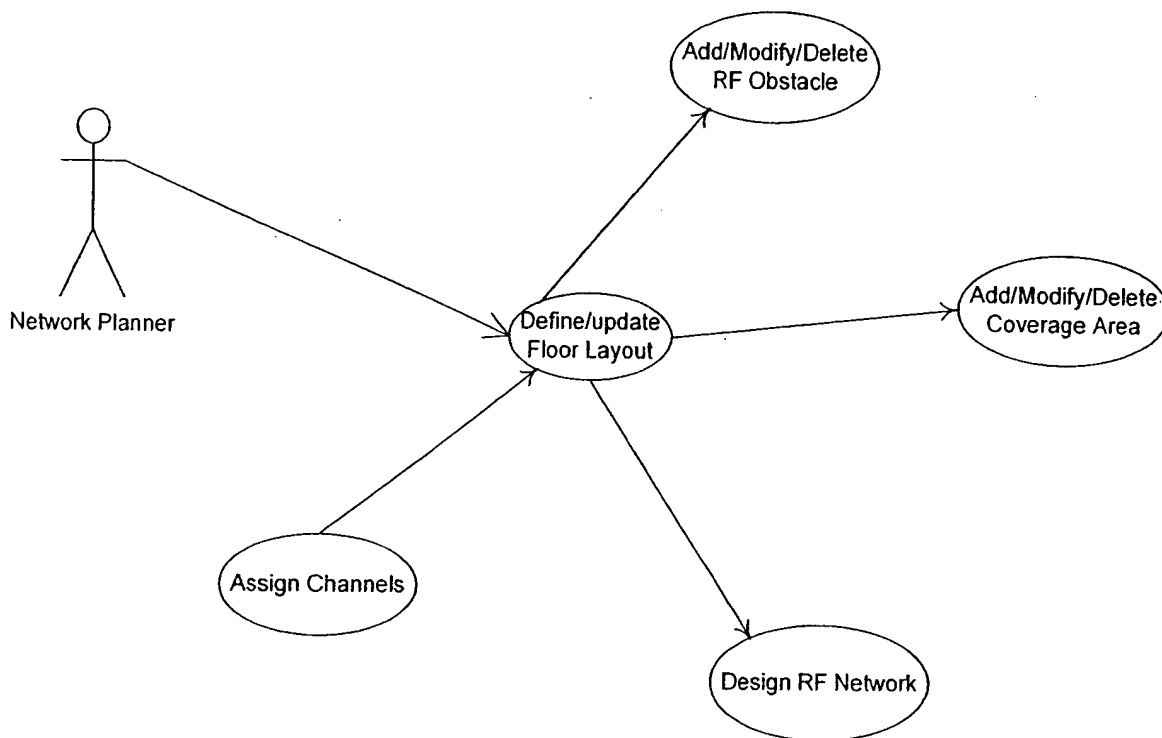


Figure 1: Overall Scenario

The network planner would do the following:

1. Define / update a Floor
2. Define /update the propagation losses on various obstacles
3. Define a coverage area
4. Request Network to be designed. The planner may choose to specify certain constraints in order to generate the RF plan.
5. Make changes to the generated plan by moving the pre-defined locations of Access Points, redefining certain constraints or changing the profile information and Regenerate the RF Plan
6. Request for automatic channel allocation.

7. Save or deploy the changes instantaneously.

1.2.1 FLOOR DEFINITION

Launch Points:

- In Buiding Layout or with a building selected:

Insert -> Floor

- With that Particular Floor selected

Edit Properties

The definition of floor shall be controlled by a wizard as defined by the following scenario:

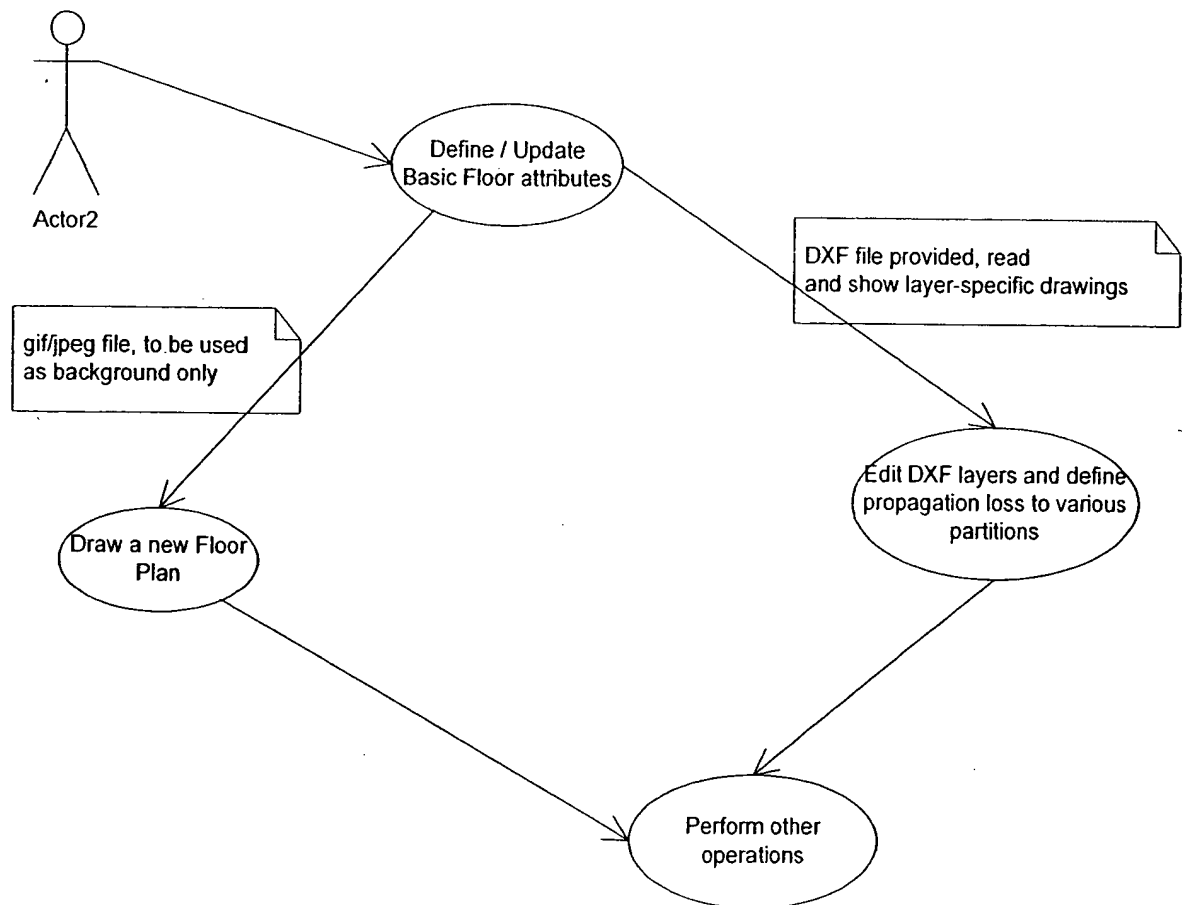


Figure 2: Floor Definition

The pages involved are as follows

Page1 : Setup







Page2: Edit Content








Page3: Define Coverage

Page4: Compute and Place

Page5: Reports

The tool bar shown in the picture above has the following operations:

Icon	Description
	Open/Close Layers Pane
	Zoom In
	Zoom Out
	Print
	Use a circle drawing to draw <ul style="list-style-type: none">- free draw- insert an area- insert a RF Obstacle
	Use a Rectangle drawing to draw <ul style="list-style-type: none">- free draw- insert an area- insert a RF Obstacle

	Use a Polyline drawing to draw <ul style="list-style-type: none"> - free draw - insert an area - insert a RF Obstacle
	Use a Parallelogram drawing to draw <ul style="list-style-type: none"> - free draw - insert an area - insert a RF Obstacle
	Use a Line drawing to draw <ul style="list-style-type: none"> - free draw - insert a RF Obstacle
	Insert the location of a wiring closet It will be shown as a diamond
	Group and Ungroup objects
	Create RF Obstacle after selecting a free draw Modify Any jump pad object if it is selected Delete any jump pad object if it is selected The free draw is also deleted
	Design RF Network Wizard Assign Channel Wizard
	Show the grid

1.2.2 COVERAGE AREA DEFINITION

Launch Points:

- In Floor Layout using the toolbar
(Shape) → Insert Area
- With that Particular Area selected

Edit Properties

1.2.3 NETWORK DESIGN

Launch Points:

Network Design can be launched only from the floor wizard

Page1: Allows the user to specify a set of constraints for the computation:

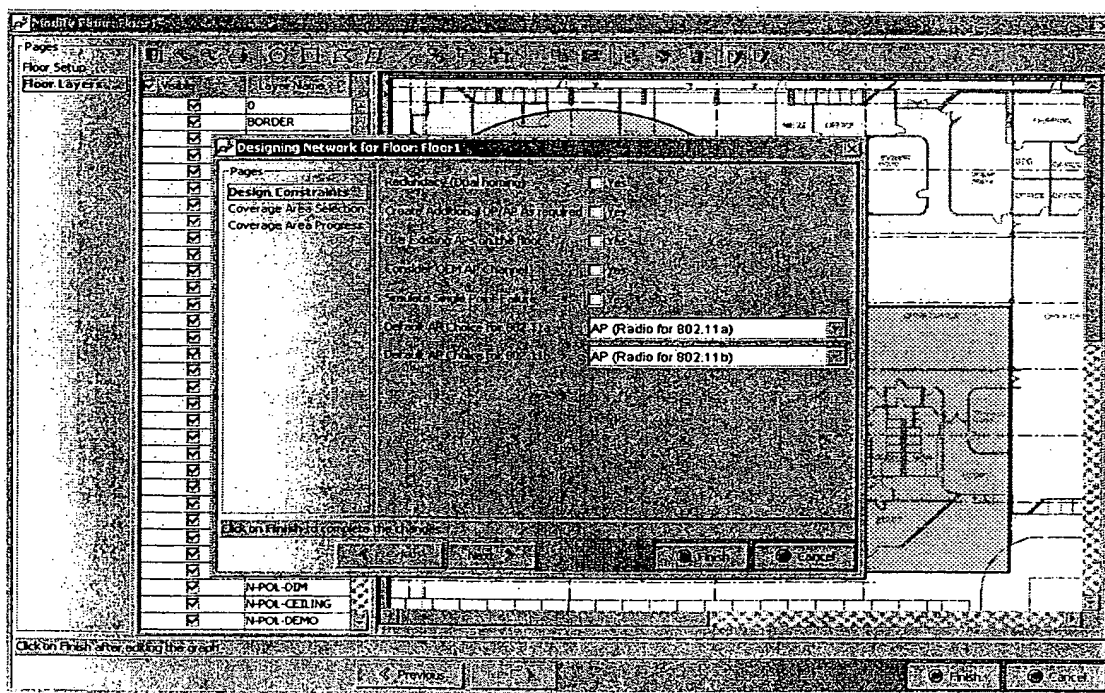
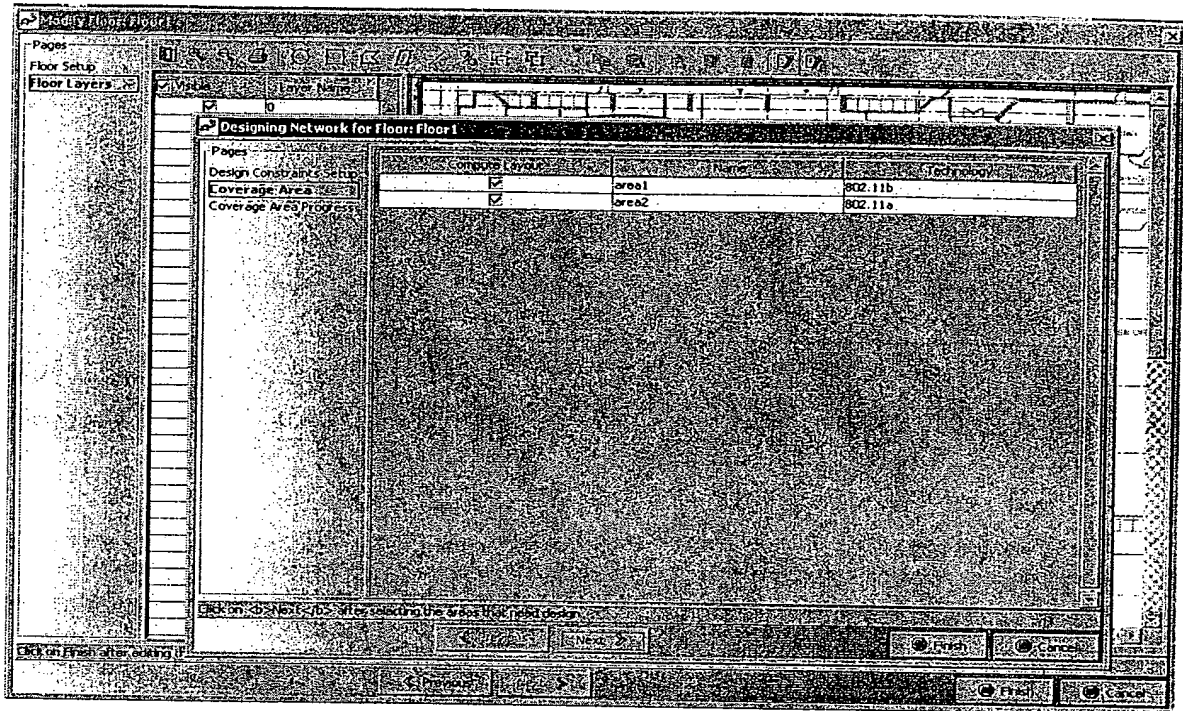
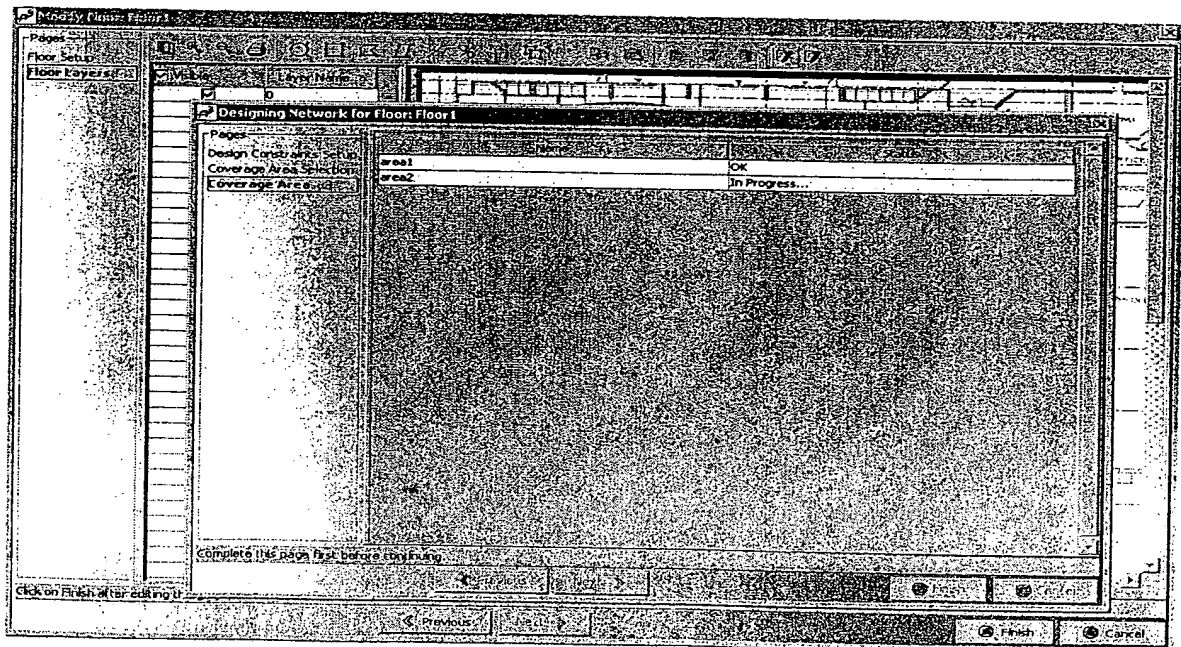


Figure 3: Request/Update RF Plan

Page2: Shows the list of coverage Areas in the floor and allows the user to select the areas that need computation



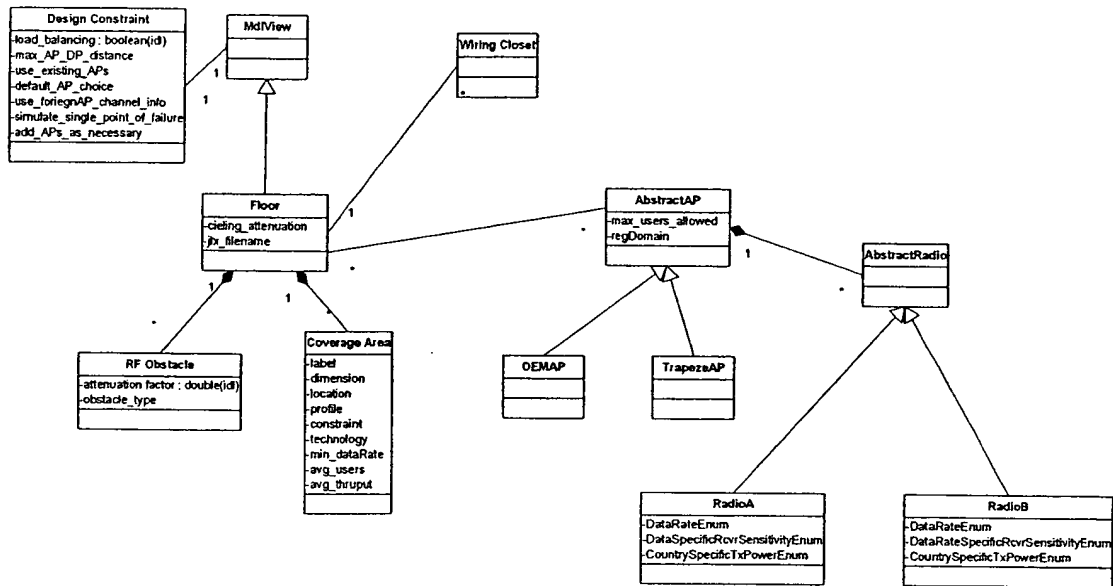
Page 3: Will show the progress of computation and upon Finish, will show all the new APs on the layout



1.2.4 ASSIGN CHANNELS

This will launch a wizard which will ask the seed AP and seed Channel number to automatically assign channel numbers to the other APs.

1.3 INFORMATION MODEL



1.3.1 FLOOR

This physical view defines the floor in the building. In addition to its floor level in the building it will allow the user to define the following additional attributes:

- Background image (gif/jpg/dxf)
- Ceiling attenuation Factor
- List of wiring closets on the floor
- List of Access Points on the floor

1.3.2 OBSTACLE

Obstacles can be of many types: External wall, Internal wall, Doors, Windows, etc.

The user can define obstacles and assign the following attributes :

- Obstacle type

- attenuation Factor
- Color

Following Rules govern the existence of a obstacle:

- A obstacle can be created/modified/deleted anytime.
- The obstacles that belong to a floor will be deleted when floor is deleted.

1.3.3 COVERAGE AREA

Coverage area is a portion of the floor where the user desires a certain WLAN connectivity. An area will have the following attributes:

- User –defined label
- User – specified area
- Technology
- Acceptable data rate
- Avg throughput
- Avg. number of users

Following rules govern the existence of an area:

- A floor can have many areas
- No two areas with the same technology requests can overlap
- An area can be created/modified/deleted anytime.
- Deletion of area will not send configuration changes to DP and/or AP.
- An area is deleted when a floor is deleted. Deletion of area does not send configuration changes to the network.

1.3.4 DESIGN CONSTRAINTS

To obtain a network from the planning tool, certain constraints can be provided by the network planner.

- Load balancing – yes/no

- Define Max. AP-DP distance
- Use Existing Access Points – yes/no
- Default Access Point choice (for 802.11a – AP with 1 radio, for 802.11b – AP with 2 radios)
- Use Foreign Access Point Channel Information – y/n
- Allow Addition of equipment – y/n
- Compute coverage for single AP failure – y/n

2 RF NETWORK DESIGN COMPUTATION

2.1 PRE-REQUISITES

Following are the pre-requisites that the user must specify before RF Network can be designed.

1. Location of atleast 1 wiring closet in the building
2. Atleast one Coverage Area defined on the floor.
3. The coverage Area that are sharing each other are completely overlapping each other.

The design would be done one coverage-area or one set of shared coverage areas at a time.

2.2 AP COMPUTATION

The crux of design is to ideally place Access Points for optimal coverage based on the demands of a certain coverage Area.

Based on the white paper written by the product management, the number of APs required for a certain area will be computed in 2 ways and the maximum of the two calculations would be the number of Access Points that jumpad would recommend for the area. For further details

The following section covers the work-flow and the equations in detail

2.2.1 DEFINITIONS

Variable	Description
AP_cap	# of APs required based on capacity needs
AP_cov	# of APs required based on coverage needs
N_users	# of users
N_totalUsers	# of total users including the roaming factor
ROAM_FACTOR	% of users that are going to roam in and out of the area
AreaBW	Bandwidth desired for the area
R_min	Desired throughput (Tx and Rx) (Mbps)
ActiveUsersPCT	% of total users that are active at any given time
R_totalArea	Total access rate for the area
R_baseline	Acceptable access rate for technology 5.5, 11 Mbps for 802.11b 36 Mbps for 802.11a
MACEffFactor	Inefficiency in MAC algorithm, Range (50-60%)
ContentionFactor	Additional slowdown due to the inefficiency of multiple users contending for bandwidth in CSMA/CA
Area_cov	Geometrical area of the Coverage Area (m ²)
F	Radio frequency in GHz
R	AP cell radius in kms
n	Path Loss exponent that increases based on the obstacles on the floor (n =2 for free-space calculation)
PL_freespace	Path loss of Trapeze AP in free space (dBm)

MAX_TxPower	Country and technology specific max transmit power of trapezeAP (dBm)
MAX_Rx_Sensitivity	Data rate specific max. receiver sensitivity (dBm)
GAIN	Antenna gain in (dBi)
Att_margin	Attenuation margin allowance (-dB)

2.2.2 COMPUTATION OF AP_CAP

$$N_{\text{totalusers}} = (1 + \text{ROAM}\%) * N_{\text{users}} \quad [\text{Eq 1}]$$

$$\text{AreaBW} = N_{\text{totalUsers}} * R_{\text{min}} * \text{ActiveUsersPCT} \quad [\text{Eq 2}]$$

$$R_{\text{totalArea}} = \text{AreaBW} / (\text{MACEffFactor} * \text{ContentionFactor}) \quad [\text{Eq 3}]$$

$$\text{AP_cap} = \text{round}(R_{\text{totalArea}}/R_{\text{baseline}}) \quad [\text{Eq 4}]$$

2.2.3 COMPUTATION OF AP_COV

Algorithm 1:

Recursively, find the number of APs that cover the entire coverage Area by starting at the center Point of the coverage Area and dividing the polygon, if the ap at the center point does not cover the entire area.

Step:

1. Given, the shape of the polygon, confirm that it is a convex shape.
2. If it is concave shape, it needs to be split into minimal convex shapes for this algorithm to work (FUTURE)
3. Compute the maximum CELL radius (R) based on path loss exponent 2. This will give the maximum distance from the AP that the radio waves can be received.

The cell radius can be calculated based on the following equation

$$\text{PL}_{\text{freespace}} = 40.225 + 20\log(f/2.45) + 20\log(R)$$

$$\text{PL}_{\text{freespace}} = \text{MAX_TxPower} + \text{GAIN} + (\text{MAX_Rx_Sensitivity}) + (\text{Att_margin})$$

4. Draw contour at the center point of the polygon. Note, this center point is computed by getting the centroid of the polygon and not by doing LxComponent.getCenter()
5. Adjust the free space contours w.r.t obstacle databasae
6. For 11a, check if the cell coverage is 85% sufficient. For 11b, check if the cell coverage is 90% sufficient.
7. If it is sufficient, record this center point as one of points for placing AP and return.
8. If is not sufficient, divide the polygon and continue with step 4.

NOTE: do the same thing for both coverage areas, if they are shared.

2.3 AP PLACEMENT

1. Select the **Max (AP_cap, AP_cov)** as the number of APs to be placed.
2. If the area is shared, then select the technology that needs most no. of APs as the area where APs need to be placed first.

FirstArea = Area where Max (AP_a, AP_b),

Second Area = Area where Min (AP_a, AP_b)

where AP_a is Max(AP_cap_a, AP_cov_a) and AP_b is Max (AP_cap_b, AP_cov_b)

3. If $AP_cov \geq AP_cap$, use the points recorded while computing AP_cov as the points where APs need to be placed.
4. IF $AP_cap > AP_cov$, then compute a set of points recursively by starting at the center of the polygon and dividing the polygon.
5. If the Area is not covered, use the next Tx power and go to Step 4
6. User can move the APs or adjust the power to visually get the area covered.
7. The user can lock the locations of the access points

2.4 FIRST GUESS POWER

To Compute the first guess power for APs after the APs are placed, we do the following

1. for every vertex of the polygon, find the closest AP and raise its power (steps of 2) to see if the vertex is reachable
2. For every AP, find a closest AP to its location and raise the power of each other to cover half the distance between them

2.5 OPTIMAL POWER COMPUTATION

To compute optimal power for a set of APs covering an area, we do the following:

1. Compute the first guess power and see if it is sufficient to cover the entire coverage area.
2. If it is not sufficient, find the best MAX power that will cover the entire area, when this power is used on all APs. The range of MAX power is from (highest of First Guess Power) to (max allowed for that tech and country)
3. Once, a best max power is found, for each AP, find the best power between (its firstguess power) and this max power, that will not reduce the area coverage percentage.

To find out if a set of power is sufficient or not, we do the following

1. Using the power, compute the contours and adjust them based on obstacle database.
2. Find the Union of all the contours.
3. Compute the area of the union. If it is 95% or more, this power set is assumed to be half good
4. Compute the number of points that were not actually covered when computing the union. This gives us a rating of how many points were missed out because of complex geometrical union. If this set of points is less than 10% of the entire points in coverage area, the power set is assumed half good.
5. If the power set is good in both 4 and 5, we take that power set to be good.

2.6 DRAW CONTOUR AROUND THE ACCESS POINT

Based on the location of AP and the cell radius, we need to draw a contour that takes into account the attenuation factors of obstacles around the AP

1. Compute the cell radius, based on power of AP. If AP is not specified, compute it using the PL_freespace.
2. Draw a circle using AP location as the center point.
3. Split the circle into a polygon with points sampled at every 5 degrees (72 points)
4. For every ray that joins center point and one of 72 points, find the farthest point based on obstacle database
5. Join the adjusted points to complete the polygon that depicts the contour.

2.6.1 FARTHEST POINT COMPUTATION

Given a ray, we need to compute the farthest point for a given path loss. The goal is how far should one march from one point to the other to reach the given path loss with obstacles taken into consideration.

1. For a given ray, find a list of obstacles that intersect it. Note its intersection points.
2. Sort this list of obstacles and intersection points based on its distance from point1 of the ray.
3. At each intersecting point, compute the $PL = PL_{\text{freespace}} + \sum \text{attenuation of obstacles that intersect till that point.}$

4. If the computed path loss is more than the passed in path loss, then use that intersection point as the farthest point. And return
5. If all intersction points were processed and the path loss is still less than that passed in, then find the farthest point where the path loss is matched. This can be done in a binary sort between the last tried point to the farthest point of the ray.

2.7 CHANNEL ASSIGNMENT

The algorithm used for channel assignment is as follows:

1. channel is assigned for all radios on the floor. All Non-trapeze APs are also considered as radios for which channels have already been assigned.
2. All radios are sorted by distance from (0,0)
3. For every radio, pick an unused channel number that can be assigned.
4. If all channel numbers are used, find out which channel number is the farthest from the radio. Use radios for which channel assignment has already been done. And use that channel number. To find the farthest channel number, sort the radios that have been assigned channels by distance from the radio in question.

3 RF VERIFICATION

3.1 OVERVIEW

RF Interference is a big problem in WLAN. The presence of RF obstacles within a floor can and will be seen on the actual coverage of devices that transmit radio signals. There is one side, where one can project based on some theoretical models that a coverage would look a certain way. This coverage computation is based on a lot of user inputs. The better job a user does in defining obstacles that can attenuate the radio signals, the more accurate the empirical models can be. However, in most of the cases, call it lack of interest in defining such an amount of information, or anything else, the information that is fed into the theoretical model is insufficient to depict the actual environment.

Interference is not the only problem in WLAN deployment. Mis-connections and mis-configurations can also exist. Problems like, "A user might have planned to connect ap1 to port 2 , but actually it got connected to port 3" can be common.

Jumppad tries to tackle these problems and provide solutions that may aid the user to better manage their WLAN deployments.

RF Verification is a process that requires interactions between user and the application. It involves various categories –

1. Verify whether all APs are connected to the correct DPs as planned/configured.
 - a. This requires not much manual intervention other than starting the verify process
2. Verify whether a certain AP can see other APs based on propagation model chosen in Jumppad.
 - a. This also requires not much manual intervention other than starting the verify process.
3. Verify whether the coverage contours drawn by Jumppad is close enough to reality.
 - a. This requires a lot of manual interaction, especially in defining the measurement points and providing signal strength data of all APs seen at that measurement point. The elements involved in this are
 - i. Lite application on a portable device (laptop or preferably PDA)
 - ii. An API to the wireless NIC to obtain required measurement readings. (this will be required to completely automate the process from the time a point is clicked on a certain floor map using the lite application)
 - iii. Necessity of moving around the coverage area/ floor to collect such data. (there are many ideas of automating this step, but this is a non-goal)

3.1.1 UNDERSTANDING OF REQUIREMENTS

This section covers the understanding of Requirements for RF Verification Tool and details the design.

- Ability to verify RF-wired topology
- Ability for the user to move around with the tool on a portable device to gather information
- Ability to Select a RF Measurement Point and request for projected signal strengths
- Ability to export an existing Floor plan from jumppad
- Ability to read in a floor plan to define RF Measurement points and RF measurements.
- Ability to import RF Measurement readings into Jumppad
- Ability to correct the attenuation factors of the RF Obstacles based on data collected at the measurement points

Following sections do define the user scenarios for solving all the above problems, but listed here is the phased approach of what feature will be available in which release of jumppad

3.1.2 RELEASE MATRIX

Feature	Jumppad Release	Comments
Verify RF-wired topology	1.0	This involves 2 items: <ul style="list-style-type: none"> - DP-AP wired connections verification - AP visibility verification
Allow user to obtain projected signal strength readings at a given measurement point	1.0	The user can then verify this information, by going to that location and actually measuring the radio signals
Allow the user to provide the actual readings of the signal strength at a given point in Jumppad	1.0	The user will have to go to the location of measurement point, measure data, and come back to jumppad to type in the data to correct coverage contours
Provide a lite Application to allow the user to move around with the floor plan to define data and new measurement points	FUTURE	

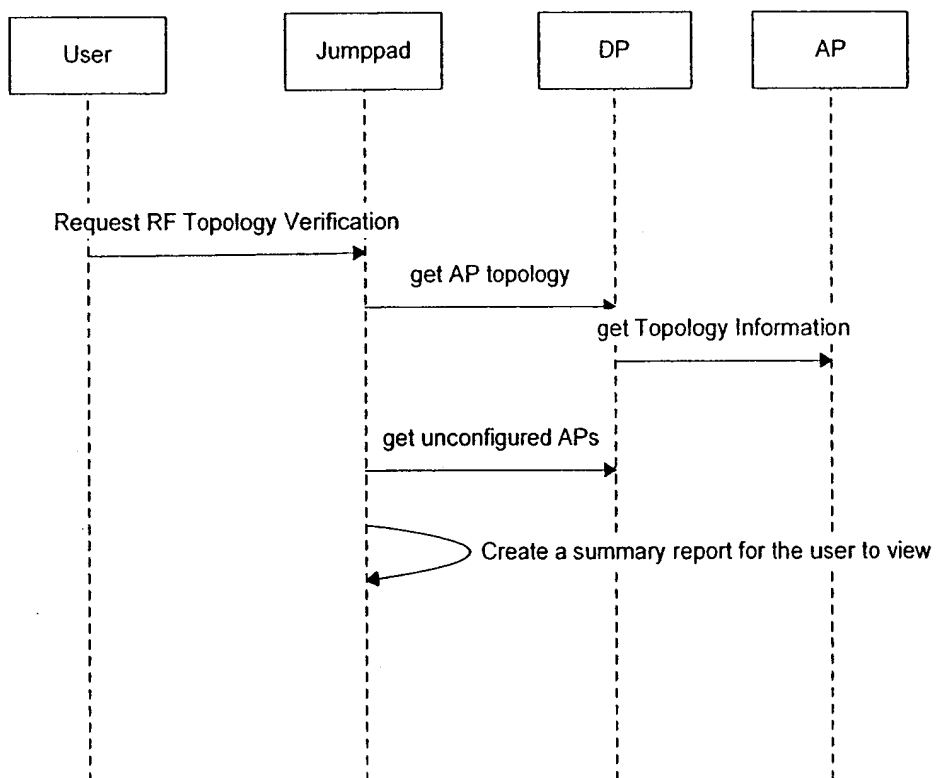
3.1.3 ISSUES / DEPENDENCIES

This feature has the following issues or depends on the following features:

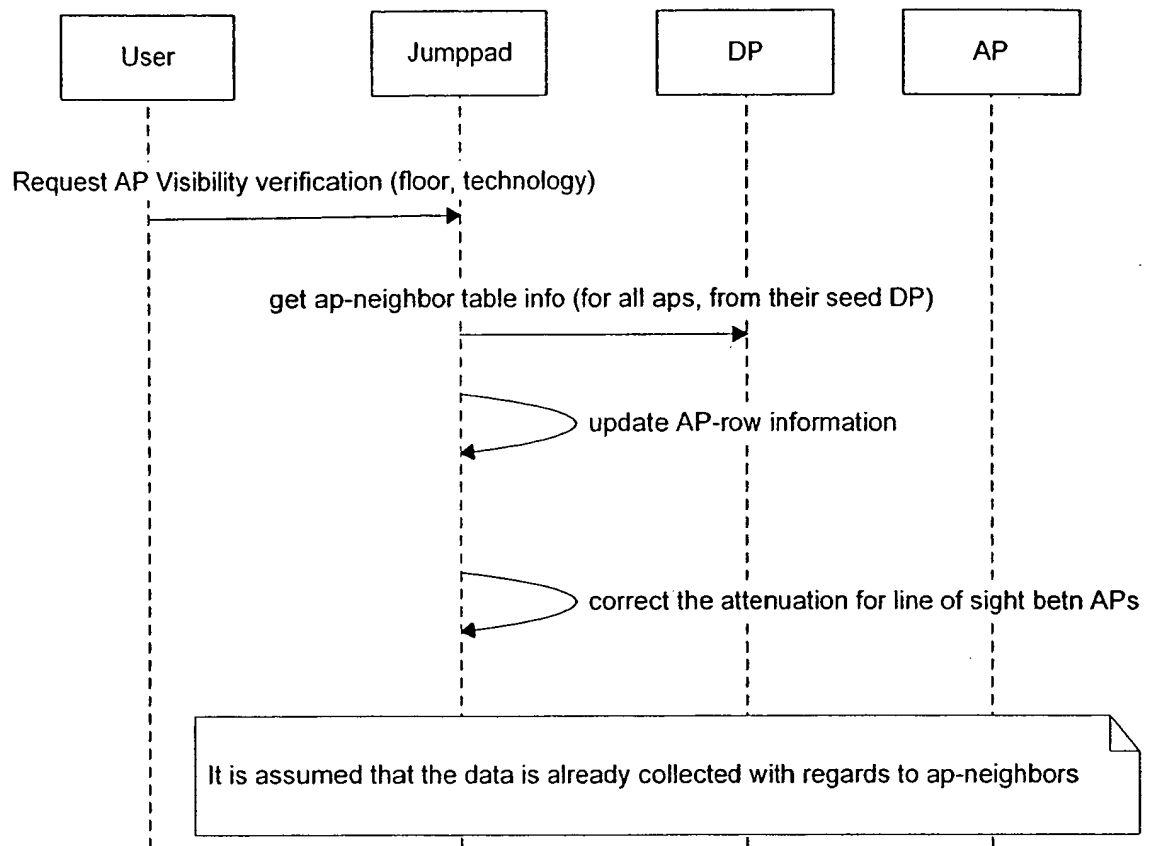
- Jumppad support of Dual-homed AP
- AP DTD definition
- Rogue AP Detection support in DP

3.2 USE CASE SCENARIOS

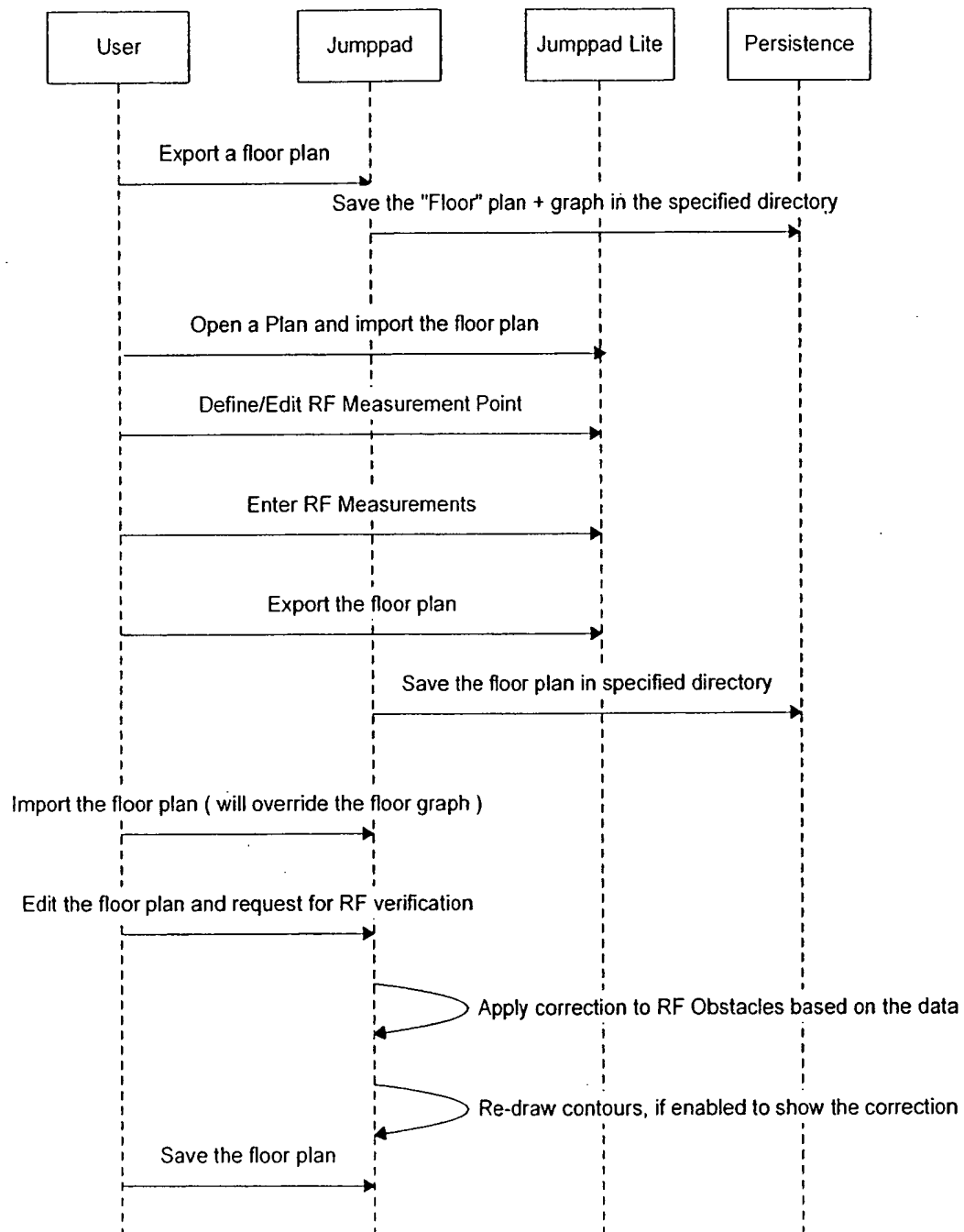
3.2.1 RF TOPOLOGY VERIFICATION



3.2.2 AP VISIBILITY VERIFICATION



3.2.3 RF COVERAGE VERIFICATION



3.3 RF TOPOLOGY VERIFICATION DESIGN (RFTOPOVERIFIER)

3.3.1 USER INTERFACE

The intent here is to show the differences between what the DPs are configured for a given AP and what AP sees from the DP.

3.3.1.1 Launch Points

Changes → Verify AP Topology

3.3.1.2 APTopoVerifierWizard

AP Name	Rule	Status	Configured Value	Actual Value
AP1	AP Product Type	OK		
AP1	RADIO 1	ERROR	RADIO A	RADIO B
AP2	PRIMARY DP	ERROR	DP1	DP2
AP2	SECONDARY DP	OK		
AP3	SECONDARY DP	ERROR	DP4	DP5
AP4	PRIMARY DP PORT	ERROR	PORT1	PORT2
AP5	SECONDARY DP PORT	ERROR	PORT4	PORT8

The wizard will have only one page as shown above. Following UI rules will apply on the page:

1. Verification can be done only per mobility domain
2. Once Verify is clicked, all other buttons are disabled and status bar will indicate that information is being obtained.
3. Jumppad will construct one big request per device with individual request per Port to get topology status on the port. ~~It is expected DP to return a config-like status object with data filled as last reported by AP~~
4. Jumppad will receive the information, try to make sense out of it and show the information in a table.
5. Edit button will be enabled only if one of the rows is selected. When a row is selected, some helpful hint will be provided to indicate what might have happened and how to fix it. Using Edit button, user can edit the Access Point (note, this will be a dual-homed object) to fix the error. Editing the object does not mean that the error is fixed from the network. A next deploy will supposedly fix the error.
6. Finish / Cancel will be enabled once Verification is complete.
7. A Cancel would discard all edits that were performed on the access point to fix it.
8. There will be some errors on access points that do not exist in jumppad at all. In such case, Edit will be disabled for such errors. This is possible in the case when the AP was not configured in jumppad, but was auto-discovered by DP and the configuration is out-of-sync. ~~(Q: Will DP be auto-discovering APs? Or will it be verifying the configuration?)~~

3.3.2 WORK FLOW

Following are the steps that jumppad will take to verify the RF wired topology:

1. Request the AP topology information from DeviceInterface
2. DeviceManager will send out requests to each of the DPs that are currently being managed by jumppad
3. DeviceManager will also send out request to obtain list of all unconfigured APs that are requesting the boot image.
4. The RFTopoVerifier will collect a list of errors on APs that have one of the following errors:
 - a. **AP product type misconfiguration**
 - i. AP is configured to be one type, but it is actually of another type (Note: this is in the case when user has created AP in jumppad)
 - b. **Radio Slot misconfiguration**
 - i. AP is configured to the right type, but the slot1 contains Radio B instead of RadioA

c. Primary DP misconfiguration

- i. AP is configured to be connected to DP1 as primary (with higher BIAS), but it is actually connected to DP2
- ii. AP is configured to the right DP, but the bias value received from the AP for that DP is not the same.
- iii. AP is configured for the right DP, but the cluster member IP address of the DP is different.

d. Secondary DP misconfiguration

- i. AP is configured to be connected to DP1 as secondary (with lower BIAS), but it is actually connected to DP2
- ii. AP is configured to the right DP, but the bias value received from the AP for that DP is not the same.
- iii. AP is configured to right DP, but the cluster member IP address of the DP is different.

e. Primary DP Port misconnection

- i. AP is configured to right AP, but it is connected on the wrong port

f. Secondary DP Port misconnection

- i. AP is configured to right AP, but it is connected on the wrong port

g. Unconfigured AP in DP

- i. AP does not exist in jumppad and this DP is getting boot image requests
- ii. AP exists in jumppad and is connected to DP2, but DP1 is getting is boot requests (Q.. will this be caught by e?)

3.3.3 ISSUES

- 6. Since any request to a device will fail if the generation count has a mismatch, it emphasizes that all devices are In-sync in jumppad.
- 7. It is not desirable to use the syslog for this information as it can take a lot of time in processing the information.

3.3.4 INFORMATION MODEL

Required Information From DP:

1. AP Topology information Status

- a. Topology information as created using the announce packet information of AP or the complete topological information from the AP. The information required is:

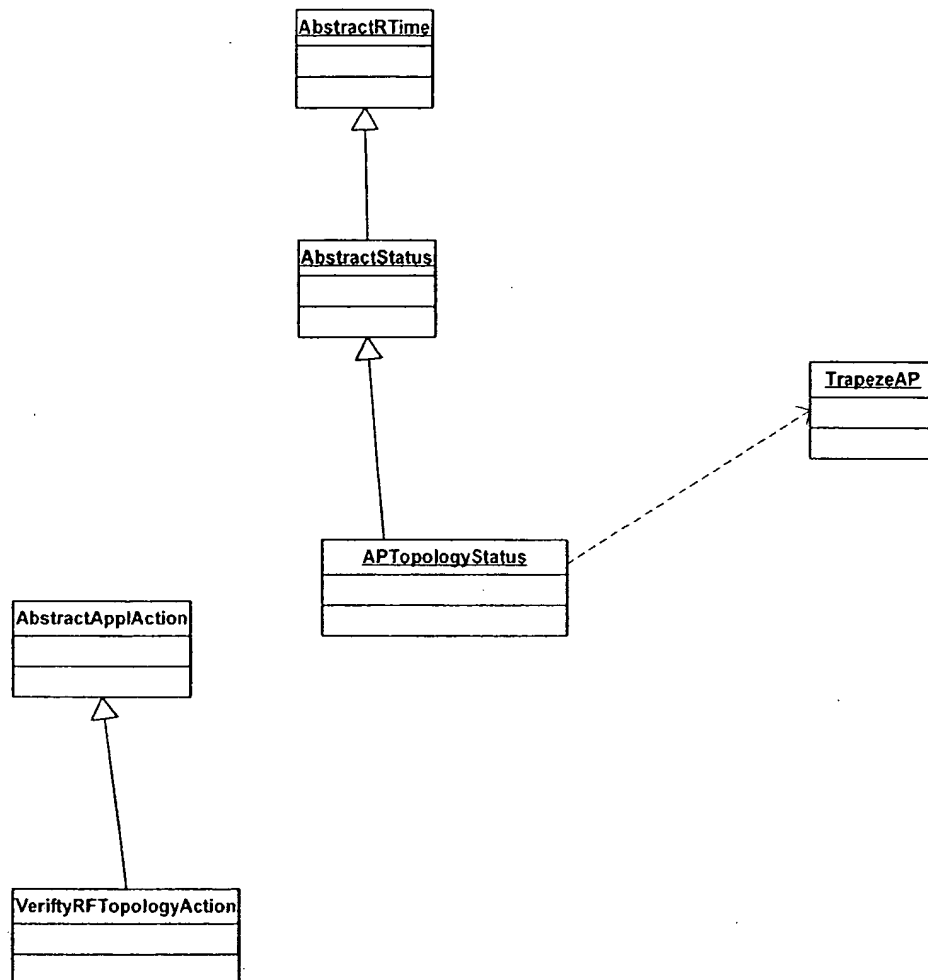
DP	IP address	DP Port Number Connected To	DP Bias Value as seen by AP	DP status as seen by AP
Primary DP	Cluster mbr ip	1..20	H/L	Up / Down
Secondary DP	Cluster mbr ip	1..20	H/L	Up / Down

Q: if AP can already say which one is Primary, is the bias information not already available that way? Ie. Does AP not make a DP primary based on bias value?

3.3.4.1 *APTopologyStatus*

- Internally generated key and transient object
- Not linked to any object in model (similar to AbstractStats Object)
- Has a key information of the associated object (in this case TrapezeAP)
- Contains the topological information that is being received from AP.

3.3.5 CLASS DIAGRAM



3.4 AP VISIBILITY VERIFICATION DESIGN (APNEIGHBORVERIFIER)

3.4.1 USER INTERFACE

The intent here is to show what an AP sees over the air. The information will have two views, one tabular, similar to a dashboard, the other viewing the errors on the graph of the selected floor.

The scope of the information that will be retrieved and shown will depend on a selection of a Floor and the right technology.

3.4.1.1 Launch Points

Changes → Verify AP Visibility

3.4.1.2 APVisibilityVerifierWizard

AP Visibility Verification

Select Floor

Technology ☒ 802.11a ☐ 802.11b

Table Layout ☒ Graph Layout ☐

Legend: Not Applicable, Configured, Actual

APs on the floor	Status	AP1	AP2	AP3	AP4	AP5
Ap1	OK					
Ap2	OK					
Ap3	OK					
Ap4	OK					
Ap5	OK					

Status:

1. AP visibility verification can be done only on a per floor and technology basis
2. Once Verify is clicked, Jumppad will send the request to one AP at a time to get the neighbors information. (Note, we can control this by another user option to send it to all APs at once or one at a time to avoid loss of wireless client connections)
3. The status column can have one of the following messages:

- a. Scheduled
 - b. Collecting Data
 - c. OK
 - d. Communication Failure
4. Once each AP sends back information, while other AP is being requested for the same information, Jumppad will populate the above shown grid as to who is available with what signal strength. (We can use the tool tip to show the signal strength, if showing a number on the signal does not look good)
5. The legend will be as follows:
 - a. Configured Value (Green)
 - b. Actual Value (Red)
 - c. Not applicable (Grey)
6. Status / List box will indicate any rogue APs that were discovered. This will however not give the user option to create the rogue AP. It is a non-goal of this feature. It is possible that the neighbor list also reports managed APs that are in a different floor.
7. In the graph Layout, the user will be able to graphically see where the errors are located. Using the BSSID information and the signal strengths received from its perceived neighbors, jumppad will attempt to approximate the location of the AP.(TBD)

3.4.2 INFORMATION MODEL

3.4.2.1 *Required Information from DP*

A table of neighbors that a particular AP sees with the following information about each neighbor:

- BSSID
- channel number
- technology
- Signal Strength
- Signal to Noise Ratio

3.4.2.2 *APNeighborsStatus*

- internally generated key
- Models the table sent from DP with regards to AP neighbors

- has a ObjectKey of the associated AP

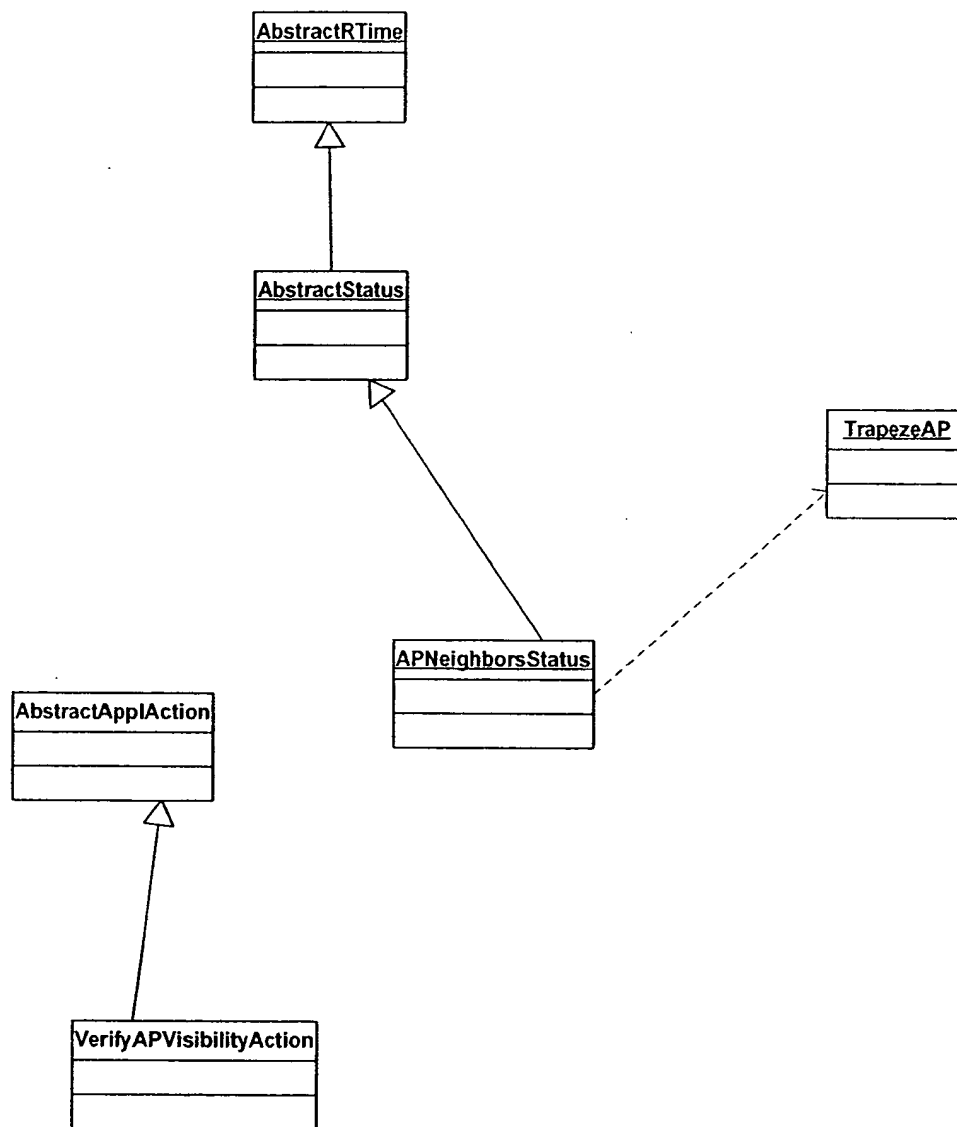
3.4.3 WORK FLOW

Following are the steps that jumppad will take to verify the RF wired topology:

1. User requests to verify AP visibility
- 2. Jumppad requests neighbor AP information from each of the AP
3. Jumppad creates a report to show the difference between the projected visibility and actual visibility (Note: it will be difficult to show the contours as it is just one reading between the two APs)

Do we do the attenuation correction here in order to correct our projected contours to be non-overlapping if a set of AP neighbors are actually unreachable?

3.4.4 CLASS DIAGRAM



3.5 RF COVERAGE VERIFICATION DESIGN (RFCOVERAGEVERIFIER)

3.5.1 USER INTERFACE

Launch Points:

From within Floor Wizard

Wizard:

RFMeasurementWizard

Pages:

- MeasurementPointsSelectPage (to select the points that u need to apply on the AP coverage)
- MeasurementEntryPage

Note: do we want to show the user the obstacles whose attenuation factors were corrected?

3.5.2 INFORMATION MODEL

3.5.3 WORK FLOW

3.5.3.1 *User needs to move around with the floor plan*

1. the user will export the floor plan from jumppad.
2. jumppad will export the "Floor" information in XML similar to device mode with all non-deployable information.
3. Jumppad will export the jlx file to the specified directory.
4. Jumppad has now created the files required to move around with the floor plan

3.5.3.2 *User runs Jumppad-Lite and loads the floor plan*

1. User launches jumppad-lite and opens a new plan
2. User imports the "Floor" into the plan. Both files must exist in the specified directory.
3. User can now launch the floor wizard by editing the floor plan
4. User can create new RF measurement points or edit existing measurement points

3.5.3.3 *User Wishes to enter RF measurements being received by the portable computer*

1. User edits the floor wizard, if a measurement point is to be created.
2. User selects a RF measurement point and launches RFMeasurementWizard to enter the data.
3. User will enter the following based on the information: This information is for the best signal being received. This measurement must be entered for the AP that the user is connected to.)
 - a. Technology (802.11a or 802.11b)
 - b. BSSID of the AP (Note: if we need to allow the user to select the AP that they are reading signal from then we need to export AP information as well and that would mean the entire plan. And by entering BSSID, it means that this verification is being done after deployment so that jumppad has the BSSID information.)
 - c. Signal strength
 - d. Frequency of the received signal
 - e. Note: Do we want the user to enter all possible values of the values received from the best signal that will define the AP proximity?
4. User then moves to the next measurement point and follows the same procedure.
5. User can create more measurement points, if needed.

Note: Must we recommend the user enters the points where they have roamed from AP to other. Does it tell us something? Do we want to infer something from here?

3.5.3.4 *User is done entering RF measurements and now wants to verify coverage*

1. User will export the "Floor" from Jumppad-lite. It will create two files, "Floor" information in XML and the J LX file.
2. User will import this "Floor" information onto existing floor in Jumppad. Jumppad will read in the edited jlx file and also apply changes to "Floor" object. (we now have all the measurements
3. User then launches RfCoverageWizard to verify the RF coverage.
4. User selects the RF measurement points that need be applied to correction of RF coverage (default would be all selected) Only those RF measurement points that have been recently read, or have a unapplied correction to attenuation factor, will be shown here.
5. Jumppad will compute the correction factors on obstacles based on the signal readings. If there is no obstacle defined and there exists a correction factor, it will create a new obstacle close to

the measurement point and assign that correction factor. Once, the correction factor is applied, the information on the RF measurement point will be nullified.

6. Jumpad uses the information obtained from RF neighbors to correct the line of sight from two given APs.
7. User may accept all corrections/changes to view the corrected contours for a given area

3.5.4 CLASS DIAGRAM

Coming soon....

RINGMASTER RELEASE 1.1 FUNCTIONAL SPECIFICATION

PROJECT NAME "NEED IT"


Revision 0.10



AUTHORS: RingMaster Engineering

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Revision	Who	Date	Description
0.1	Allan		Original, incorporated various mini-func specs into this one
0.2	Sudhir		Added contents to RF planning section
0.3	Sudhir		Added UI screen shot for WPA support and updated impact of 11g on channel assignment
0.4	Sudhir		Added UI screen shots which will be affected by 11g in an incremental way
0.5	Kishan		Added HP Openview integration section
0.6	Allan		Add mob acs placeholder and cleanup rest
0.7	Sudhir		Changes to 11g and WPA based on internal review
0.8	Yun		Added rules implemented in 1.1 and additional config support
0.9	Jeff/Sudhir		Added Event Viewer enhancements. Removed WPA2 as a possible security mode
0.10	Sudhir		Changes to 11g based on 11g review meeting

1 INTRODUCTION

1.1 GOALS AND SCOPE

The goal of this document is provide a functional specification of the additional features and functions for RingMaster 1.1.

1.2 OVERVIEW

RingMaster V1.1 is a minor update to the field that includes the following high-level features:

- HP OpenView Integration
- Solaris OS Support
- MSS 1.1 Support
 - WPA
 - 11G Support
 - Boot/Upgrade changes
 - Not yet understood if this impacts RM or not
 - Mobility ACLs
 - Not yet understood the full impact of these changes

In addition to these new features, RingMaster functionality will also be changed in the following areas:

- Transaction Management
 - To improve scalability and performance (i.e. MROW)
- Versioning
 - Fundamental to support 1.0 and 1.1 MSS versions at the same time in RingMaster.
- Additional Rules
 - Including some new rules we missed or deferred in 1.0
- Bug Fixes deferred from 1.0 or found in FCS version of RingMaster

2 802.11G SUPPORT

802.11g is a RF technology that works on the same frequency band as 802.11b. It is similar to 802.11b in channel numbers allowed for the technology. It uses a different modulation to provide the high over-the-air data rate. It is possible for a 802.11g radio accept 802.11b client. This degrades the 802.11g performance.

2.1.1 INFORMATION MODEL

2.1.1.1 RADIO

Radio Type: A radio can be of the types 802.11b, 802.11a, and 802.11g.

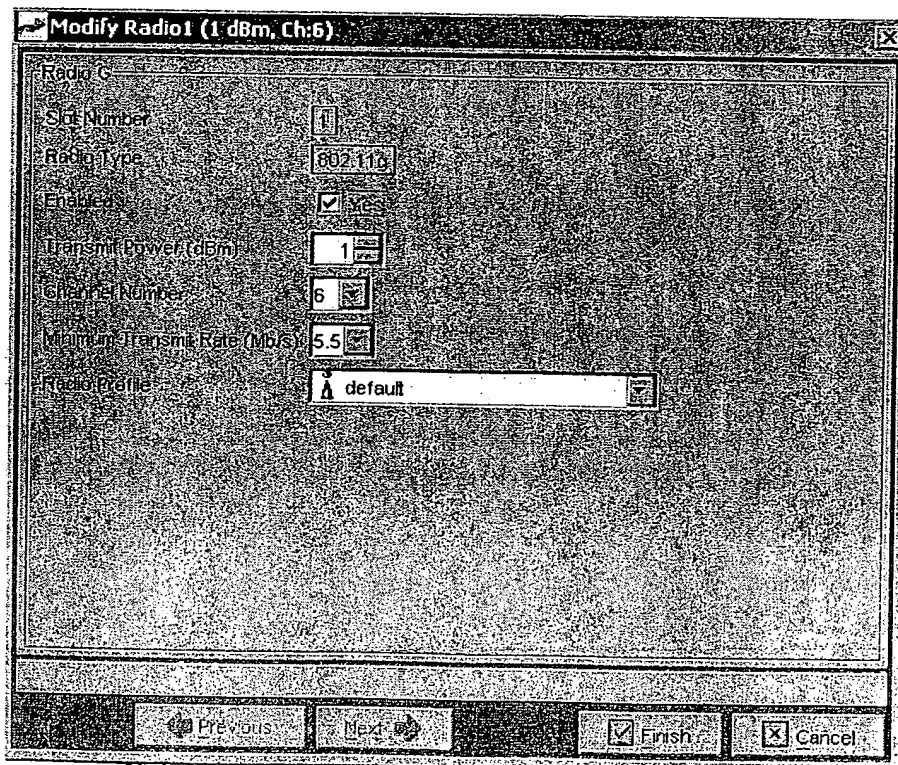
Channel Numbers:

802.11g uses the same channel set as 802.11b. However, it is possible for some countries not to support it.

Transmit Power:

From the regulatory domain point-of-view, 802.11g can use powers similar to 802.11b. The variation of transmit power for a 802.11g radio will depend entirely on the chip-set used. This information will also be product management.

Action Item: (Product Management): To provide Country specific information with related to 802.11g support



2.1.1.2 RADIO PROFILE

Force 11g only: This attribute is required for 11g radio to allow / restrict 11b clients. When checked, it will be in "pureG" mode and when unchecked, it will be in "mixedBG" mode. When in mixedBG mode, the radio can accept 11b clients and also listen to 11b beacons.

2.1.1.3 MP-MODELS

The following new models will be available to support 802.11g. the actual model number cannot be specified as yet.

- Single-radio-802.11(a, b, g)-only (In this document, referred to as MP-241)
- Dual-radio-802.11(a, b/g) (In this document, referred to as MP-252) since the BG radio can be soft configured as 11b or 11g, the radio type attribute will qualify this information.

With the possible introduction of these two modules, RingMaster will allow possible MP models

MP Model	MP type	Radio Type (MP subtype)
MP-122	MP-122	None

MP-101	MP-101	11a or 11b
MP-241	MP-241	11a or 11g
MP-252	MP-252	None

2.1.1.4 RECEIVER SENSITIVITY:

The receiver sensitivity of the radio in 802.11 g will not be the same as 802.11b due to the variation in possible data rates. The sensitivity for 11g radio is shown in the following table. As a comparison, the same for 11b/11a are also shown.

Data Rate (Mb/s)	802.11a	802.11b	802.11g
1		-92	
2		-90	
5.5		-89	
6	-88		-88
9	-86		-86
11		-87	
12	-85		-85
18	-83		-83
24	-80		-80
36	-76		-76
48	-71		-71
54	-70		-70

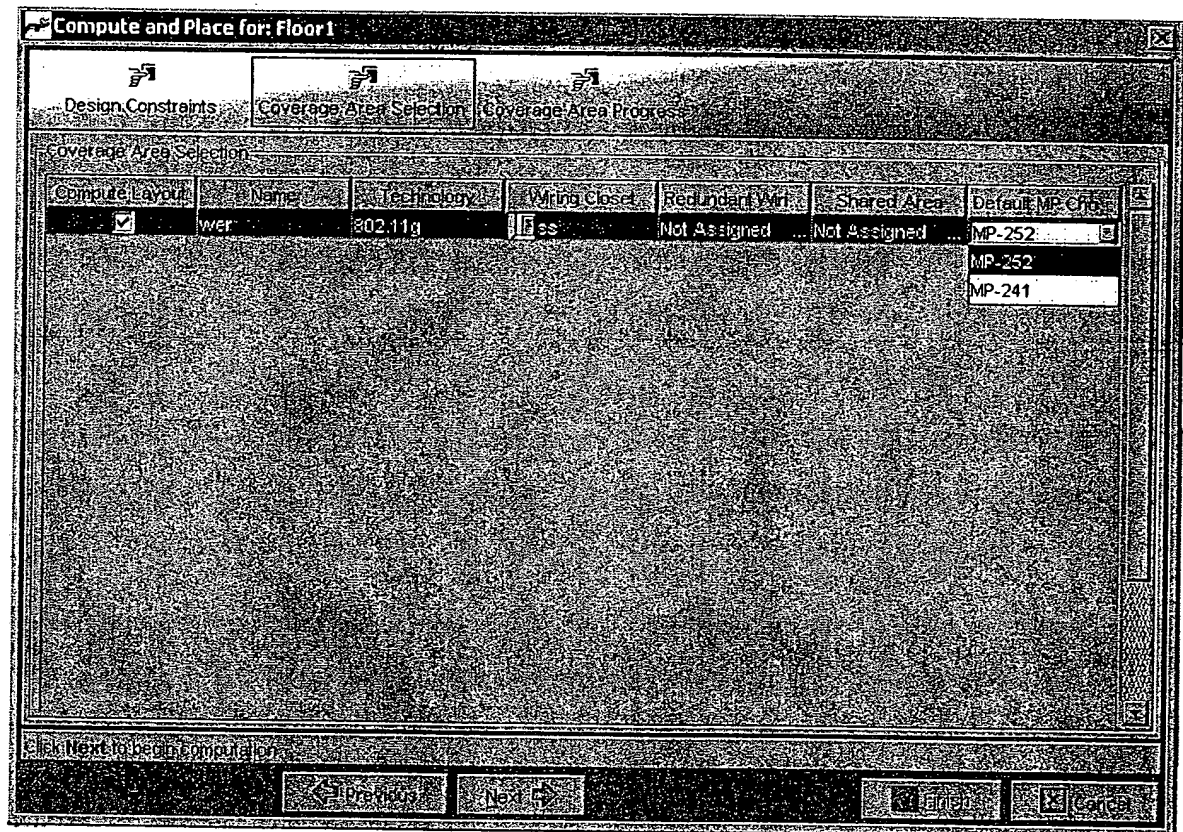
2.1.1.5 DESIGN CONSTRAINTS

There is a design constraint that the user is allowed to select:- Default MP Choice. Currently, it has choices of MP models. With the introduction of 11g, it is no longer the entire floor option as all models do not fit all combinations of technologies. Therefore, this constraint will become an attribute on Coverage Area and will also be allowed to change in 2nd page (coverage Area selection) of Compute and Place wizard.

The choices that will be available for coverage areas are as follows:

Area technology	Choices	Default Choice
11a, unshared	All choices	MP-241
11b, unshared	All choices	MP-241
11g, unshared	New models only	MP-241
11a and 11b, shared	Dual Radio models only	MP-252
11a and 11g, shared	New dual-radio model only	MP-252

The 2nd page in compute and place operation will look as follows:



2.1.1.6 COVERAGE AREA

When creating a coverage area, the user can choose from the following in addition to the existing choices:

- 802.11g only
- 802.11a and 802.11g

Coverage Area will have an additional attribute to allow/disallow 802.11b clients. This information will be rippled to all the associated 11g radios in the coverage area.

ForceG: This attribute will be provided to allow the user to force 11g mode on the radios associated with a 11g coverage area. This attribute will be enabled and visible only for 11g coverage area.

Radio Profile: the user will be able to choose a radio profile that will be applicable to all the radios of the given coverage area. If the selected radio profile is not found in the configuration of the device of any radio, the radio profile configuration is applied to that device.

- i. The list of radio profiles that will be available will depend on the mobility domain associated with the coverage area. It will show all the radio profiles that are policies
- ii. The user will be able to create a new radio profile policy from the area wizard.
- iii. Any changes to the radio profile property will apply to all radios associated to the coverage area when the modify wizard is finished.

The screenshot shows a 'Modify wizard' window with two tabs: 'Area Properties' and 'Area Associations'. The 'Area Properties' tab is active and contains the following fields and controls:

- Name:** A text box containing the value '754'.
- Technology:** A dropdown menu showing '802.11g'.
- Disallow 802.11b clients:** A checkbox that is checked.
- Check to disallow association of 802.11b clients to any radio in this area:** A checkbox that is unchecked.
- Basic Association Rate (Mbps):** A spin box set to '11'.
- Station Throughput (Kbps):** A spin box set to '1,000'.
- Expected Station Count:** A spin box set to '50'.
- Station Over Subscription Ratio:** A spin box set to '5:1'.

At the bottom of the dialog, there is a text field labeled 'Type the Name of the Coverage Area' and four buttons: 'Previous', 'Next', 'Finish', and 'Cancel'.

2.1.1.7 RF OBSTACLES

The Attenuation factor of an RF obstacle is same in 11b and 11g as they share the frequency band. The Label of the attenuation factor will reflect the same.

2.1.1.8 CHANNEL SET

Similar to 11b, 11g needs a channel set selection at the network plan level. However, since they share the same frequency band, the selection of the channel set must be same for 11b and 11g. Hence, the label will reflect that this channel set is for both 11b and 11g.

2.1.2 MP COUNT COMPUTATION

As 802.11g radio can accept 802.11b clients, it becomes critical in MP count computation based on capacity that this behavior is known. This behavior also depends on the final chip-set that is selected. Going on the assumption that this is possible, this information should be known before capacity based computation is performed.

Here are the values of some constants used in the computation logic:

Constant or Attribute	11a	11b	11g
Loss Margin	5dB	10dB	5dB
Baseline association rate	36 Mbps	11 Mbps	24 Mbps
Minimum transmit	18 Mbps	5.5 Mbps	12 Mbps
Baseline association rate for 11g in mixedBG mode			<i>Will not be more 11 Mbps</i>
Minimum transmit rate for 11g in mixedBG mode			<i>Will not be more 5.5 Mbps</i>

Action Item: (Product Management) to provide the defaults of baseline association rate for 11g.

This behavior does not impact the coverage based computation as in the empirical model, the frequency for both 802.11b and 802.11g is the same. All 11g constants will be used for computation. Therefore, the maximum receiver sensitivity will be used based on the association rate specified.

2.1.3 MP PLACEMENT COMPUTATION

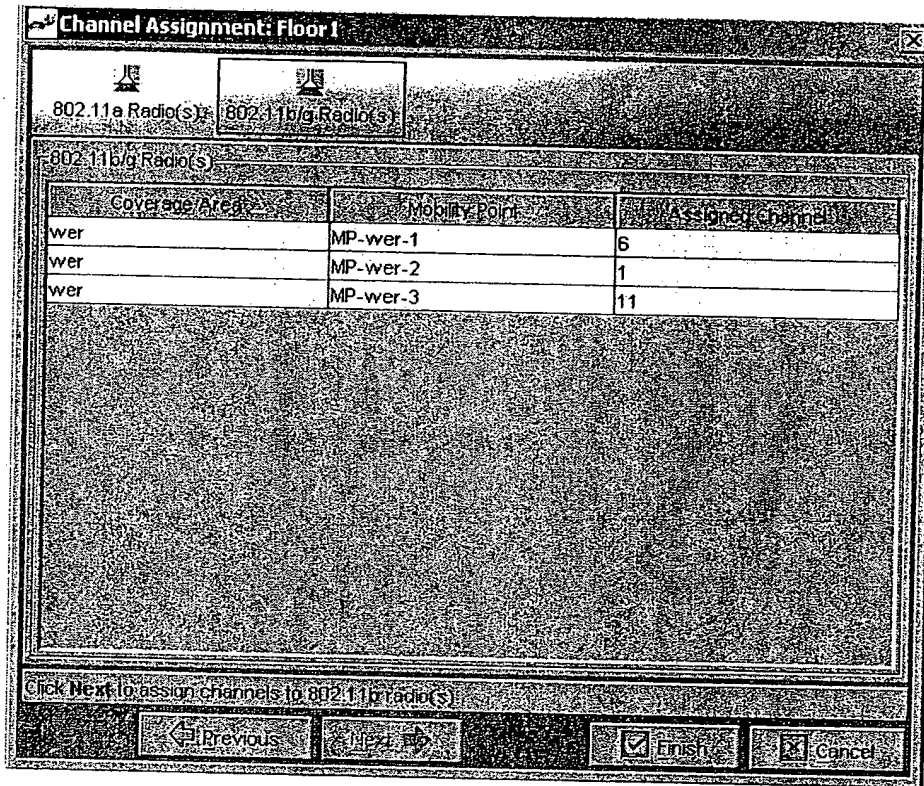
There is no impact to the placement of MPs with introduction of 802.11g

2.1.4 OPTIMAL POWER COMPUTATION

There is no impact to optimal power computation of MPs with introduction of 802.11g.

2.1.5 CHANNEL ASSIGNMENT

11g uses the same channel numbers as 11b. So, when channel assignment is performed for the entire floor, all 11b and 11g radios will be considered together to reduce co-channel interference. The UI will show all the 11g radios in the current 11b page.



2.1.6 RF COVERAGE

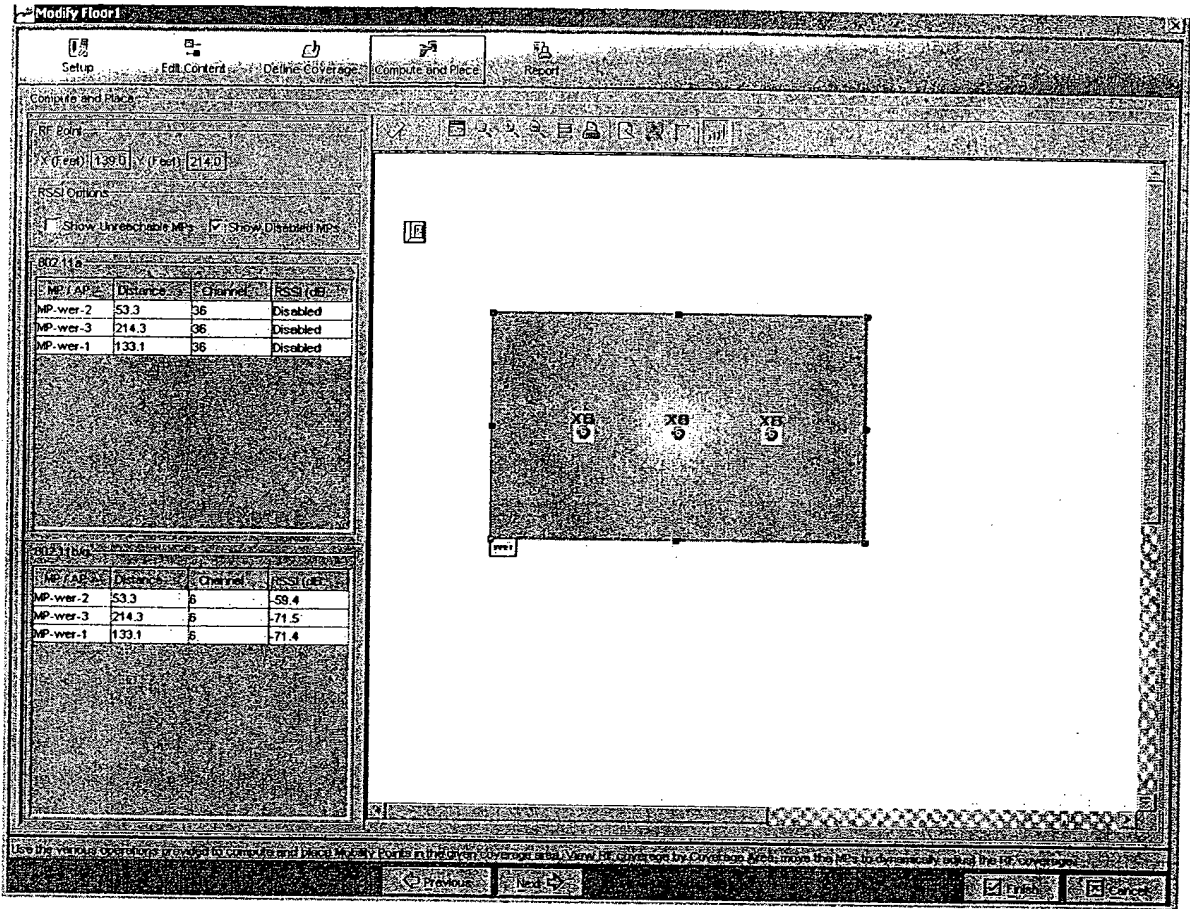
To draw contours to depict RF coverage for a 11g radio, a user must specify if the contour is needed to be shown as 802.11b or 802.11g.

There will be an additional option in the pop-up menu on MP to view 11g RF coverage. If a coverage area is selected, it will draw RF coverage for the technology of the coverage area.

When an 11g coverage area is selected, the user may choose to draw RF coverage for its associated radio in 11b or 11g.

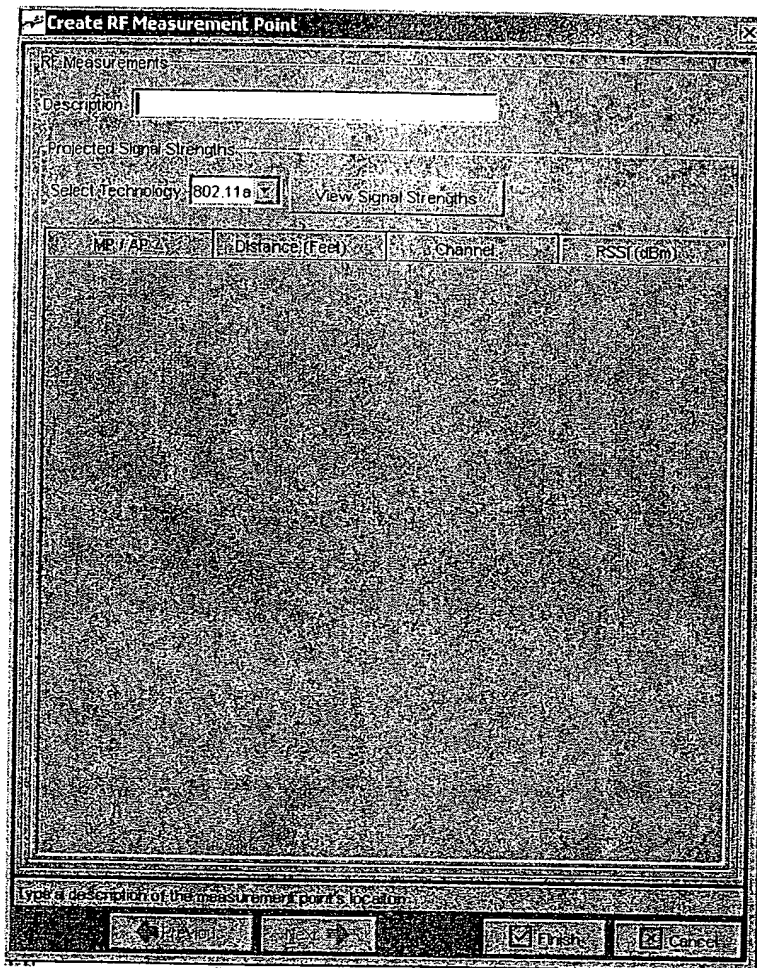
2.1.7 RF MEASUREMENT MONITORING MODE

RF Measurements are analyzed together across 11b and 11g. Following UI will show RSSI readings from 11g radios in the 11b panel.



2.1.8 RF MEASUREMENT POINT MODIFY WIZARD

Similar to reasoning mentioned in the above section, in the modify wizard of a RF Measurement point, the technology option of 11b will be changed to 11b/g.



2.1.9 WORK ORDER CHANGES

Wherever the coverage Area (802.11b) is shown, it will now show "Coverage Area (802.11b/g)". As an example of the work order snippet table for an MP location:

2.1.9.1 . LOCATION OF MP-QE-3

Model	MX Port (Name:Port)	MX Port (Name:Port)	Coverage Area (802.11a)	Coverage Area (802.11b/g)
MP-252	MX284:P03		Area_a	Area_g

Also, the RSSI readings of 11b and 11g radios will be shown in one table in all the places in the work order.

2.1.10 FLOOR VIEW

A new icon will be added to view the RF coverage of 802.11g areas or radios. An option in the pop-up will be added to view the 11g RF coverage

In the read-only view, the 11g-icon will draw RF coverage for a 11g radio in "pureG" mode. And 11b-icon can be used on a 11g radio to view the RF coverage in "mixedBG" mode.

2.1.11 VERIFICATION RULES

1. Rule to verify that all 11g radios associated with one coverage area are in the same mode of "pureG" or "mixedBG"
2. Rule to verify that the 11g radios associated with a coverage area belong to 1.1 running MX.
3. Rule to verify that the selected Radio profile for a coverage area is the same for the associated radios
4. Rule to verify if the selected MP type is supported in the version of MX that is being deployed to.
5. Rule to verify the following on a coverage area:
 - a. If Coverage Area is for 11g and has been forced to use 11g mode, the associated radio profile needs to specify a mode to match the same.
 - b. If Coverage Area is for 11g, the associated radio profile needs to specify a mode that is NOT "11b only"
 - c. If Coverage Area is for 11b, the associated radio profile needs to specify a mode that is NOT "11g only"

2.1.12 RF DETECTION AND DISPLAY OF ROGUES/KNOWN DEVICE

With the introduction of 11g, RF detection module needs updates to do the following

- allow user to exclude 11g radios
- view 11g discovered devices
- view 11g known devices
- Locate a 11b transmitter, where one 11g is a potential listener. A 11g can listen to 11b only when it is in "mixedBG" mode

2.1.13 CLIENT LOCATION

With the introduction of 11g, client location module needs updates to handle an 11b client being seen by a 11g radio.

2.1.14 NETWORK TOPOLOGY VERIFICATION

With the introduction of 11g, verification of network topology, possibly, needs updates to the new model types and new radio type.

2.1.15 CLI MAPPING/DTD CHANGES

There will be a need to correct the CLI mappings for some commands that will have additional attributes or values.

Action Item: (Product Management) to provide CLI commands changes to incorporate 11g.

Action Item: (Engineering) to decide on DTD changes to incorporate 11g

2.1.16 STATISTICS

There will be additional fields in radio statistics with introduction of 11g. Because of this, the radio statistics display will need updates

Action Item: (MP team) to provide additional fields in radio statistics

2.1.17 IMPACT OF MX VERSIONING

Certain CLI commands or attribute value pairs will not be available for certain versions of MX software. This will impact various planning operations.

1. The user will be able to change the MP type irrespective of the version of MX it is connected to. A verification rule will catch any unsupported mp type errors.
2. Planning tool will create new MX for 11g, if there are no 1.1 MXs in the wiring closet with free ports for MPs.
3. Any 1.0 MX that is uploaded in a network plan for a country-code that is not allowed in 1.0 will be marked as ready to be upgraded to 1.1. This can happen as country code is an optional configuration in basic setting of the box. **Note:** RingMaster must let the user know if there is no 1.1 image present for upgrade to such box, upon next deploy. An example of the work flow will be:
 - a. user creates a network plan for the new country code
 - b. User uploads an MX that is running 1.0 image
 - c. Ringmaster will accept the configuration from that box and
 - i. Change the country code to that of the plan
 - ii. Mark the mx for "image and config" upgrade during the next deployment
 - d. Upon next deployment, the user will be prompted if there is no 1.1 image present in the image repository

2.1.18 NON-GOAL

11g introduces a mechanism in which a radio can go into “protection” mode to further reduce the throughput. This normally happens when in 11g-environment, a 11b devices are nearby.

Although, MP radio can provide such information in its status, if the radio has gone into protection mode or not, there is currently no requirement in RingMaster to display this information.

3 CONCAVE SHAPE SUPPORT

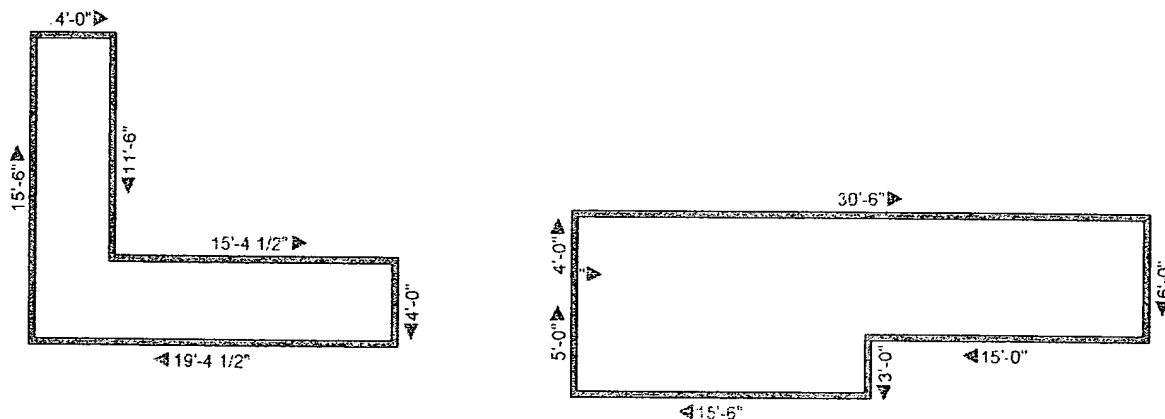
In current implementation of RingMaster, planning tool was unable to handle concave shapes. Also, the shared areas were said to be exactly overlapping each other. Here, we try to solve both of these issues to make the planning tool less restrictive.

The support of this feature will be able to handle the following

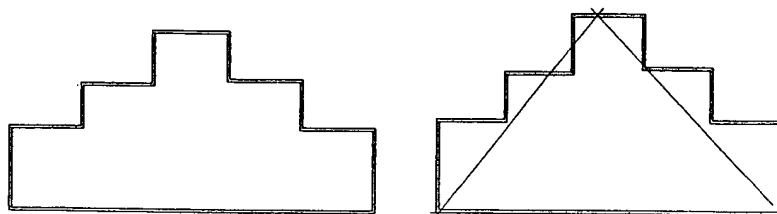
- Concave shaped coverage areas
- Shared coverage areas to use shared MPs only in the overlapped areas

A concave shape is one where any internal angle of the shape is greater than 180 degrees. The user will be able to draw this kind of shape and the planning tool will be able to handle coverage based computation and placement of the APs.

Some examples of concave shares are as follows:



Caution will still have to be taken as to how many such concave angles are provided in the coverage area that is drawn. As an example, if the floor plan does look like the one shown below, a triangular coverage area might end up giving a better result. Geometrically, planning tool will be able to handle any shape, however, more complex concave shapes might end up in slow performance and high number of AP count.



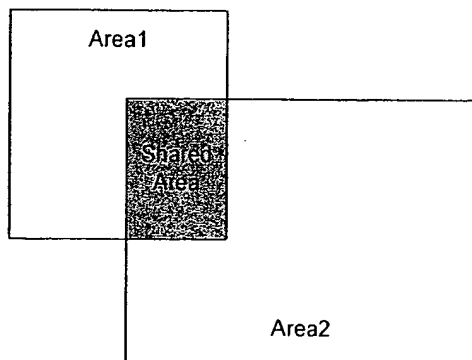
This restriction might not exist by the time this functionality is implemented. But, it is brought out here as possible caution point for planners.

3.1.1 DECOMPOSITION OF A CONCAVE SHAPE

An appropriate algorithm will be chosen to solve this issue.

3.1.2 SHARED COVERAGE AREAS

The user will be able to share MPs across coverage areas that are not completely overlapping each other. As an example, the user will be able to draw the following two coverage areas and then mark it shared. The planning tool will share the MPs only in the overlapped area and compute and place MPs in the unshared area based on the constraints.

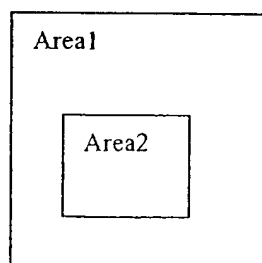


The scope of shared areas still stands as follows:

- No two Coverage areas of the same technology can be shared
- Coverage area for 11b and 11g cannot share MPs
- When placing APs in shared areas, all APs are assumed to be dual-radios
- Any dual-radio mp that belongs to each coverage area and is not locked is a potential candidate to be placed in the shared area.

In addition to the above constraints, following additional rules will apply:

- If the shared area is 90% or more overlapped, then the planning tool will assume the entire area to be overlapped and use the coverage area for 11a as the basis.
- If one coverage area is completely inside the other coverage area, they will not be considered as shared areas. An example is shown in the following picture.



4 MOBILITY ACL SUPPORT

Needs to be defined what this requires.

5 WPA SUPPORT

Wi-Fi Protected Access is a specification of standards-based, interoperable security enhancements that strongly increase the level of data protection and access control for existing and future wireless LAN systems.

Currently, the security mode is assumed to be Legacy WEP and the authentication mode is assumed to be 802.1X. In addition, the user may define WEP keys 1...4 at the Radio Profile. Such configuration is applied to all radios associated with that radio profile.

Enhancing on the same lines, the following additional choices will be available on a Radio Profile.

5.1.1 INFORMATION MODEL

Following security modes will be supported by future releases of MX and MP. Each security mode has certain constraints on the following types of information

1. Authentication mode (Multi-select)
 - a. 802.1X
 - b. PSK (Pre-Shared Key)
2. Encryption mode: (Multi-select)
 - a. TKIP
 - b. AES
3. Keys
 - a. 4 40-bit or 128-bit Keys for WEP
 - b. 1 63-char Key for PSK.

Note: PSK may be defined per MAC-user as well. However, it is not yet decided what route of PSK will be allowed in Trapeze mobility system.

4. Counter Measure Time
 - a. the counter measures are spawned when the Message Integrity Check ("MIC") is triggered under conditions defined by the WPA specification. Default: 60 seconds.

5.1.1.1 LEGACY WEP

This will be supported for backward compatibility. It is similar to what exists in release 1.0. The user may choose to specify 40bit or 128bit WEP keys. A total of 4 WEP keys may be defined.

The authentication mode is always 802.1X. Hence, this information is not available for the user to modify

5.1.1.2 *WPA ONLY*

This type of security mode involves the following:

- Allows any combinations of Authentication modes
- Allows any combination of Encryption modes
- If the Authentication mode is PSK, the user may specify a key using the allowed valid characters
- No WEP keys need be defined.

5.1.1.3 *LEGACY WEP + WPA*

This type of security mode allows clients that talk Legacy WEP or WPA. This involves the following:

- Allows any combination of Authentication modes. This is applicable to WPA only
- Allows any combination of Encryption modes. This is applicable to WPA only
- A PSK key may be defined if PSK is selected.
- Upto 4 WEP keys may be defined for use of Legacy WEP.

5.1.2 *USER INTERFACE*

The UI screen will look something like this on the Encryption page when editing a Radio Profile

Modify Radio Profile:

Encryption

Security Mode: **WPA + WEP**

Authentication:

802.1X Enabled: ☒ Yes

PSK Enabled: ☒ Yes

Pre-shared Key:

Encryption:

TKIP: ☒ Yes

AES: ☒ Yes

WEP Keys:

WEP Key:

WEP Key:

WEP Key:

WEP Key:

Buttons:

Summary of Modes:

Mode	Authentication	Encryption	Keys
WEP	802.1x checked and disabled PSK disabled	TKIP and AES disabled	WEP Key1..4 enabled Pre-shared Key disabled
WPA	Both enabled, by default, only 802.1X checked	TKIP and AES enabled, none checked by default	WEP Key1..4 disabled Pre-shared Key enabled, only if PSK is checked
WPA + WEP	Both enabled, by default, only 802.1X checked	TKIP and AES enabled, none checked by default	All keys enabled, PSK is enabled only if PSK is checked

5.1.3 FAULT / EVENTS LOGGING

Useful information that may be obtained from the radio w.r.t. the security is when the radio has gone into performing counter measures. This normally happens when the radio has been hacked into. What the radio does is disassociate all clients and not associate any client for a period of time that can be configured.

It is suggested that a trap be defined in the MX that may be received by NMS monitoring applications, like HP Openview.

Action Item: (MX Team) to confirm if there is an addition of a FACILITY with introduction of WPA.

If the above action item results in an additional Facility, RingMaster will have minor changes to the preference panel.

5.1.4 STATISTICS

New statistics will be defined when WPA is implemented. Currently, no new statistics are defined. If new statistics are implemented, there will be certain changes to Radio based statistics.

Action Item: (MP team) to define new statistics for WPA, if applicable

5.1.5 VERIFICATION RULES

1. A Rule to verify that if an Authentication mode of PSK is selected, a non-empty PSK key is specified.

5.1.6 CLI MAPPING / DTD CHANGES

New commands will be added and this will require mapping to show changes in RingMaster

Action Item: (Product Management) to provide new CLI commands

Action Item: (Engineering) to decide on DTD Syntax to exchange this configuration

5.1.7 IMPACT OF MX VERSIONING

Certain CLI commands or attribute value pairs will not be available for certain versions of MX software.

6 SOLARIS OS SUPPORT

The Solaris Operating System requires the installer to be updated to handle installation as well as other environment updates.

The default location for RingMaster on Solaris will be: /opt/trpz/ringmaster

The sub-directory structure under the install directory will be the same as Windows.

All user and system preferences are stored [to be figured out where they go but it will be significant]

[more flushing out required]

7 HP OPENVIEW INTEGRATION

7.1 OVERVIEW

Here is a brief list of features that will be implemented in Release 1.1:

- Installation of integration files
- Menu and Toolbar Integration
- Symbol Integration

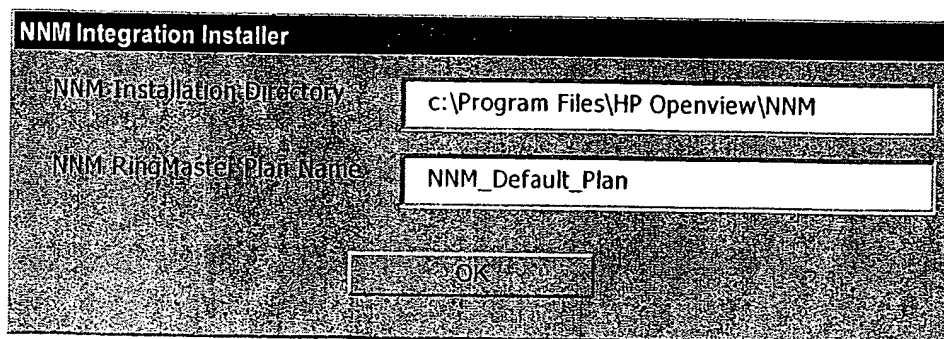
7.2 INSTALLATION OF INTEGRATION FILES

There will be a separate installer to install NNM integration files. At the end of RingMaster installation user will be prompted whether he would like to install NNM integration module. User can proceed with NNM integration installation or come back at a later time and run this installation. RingMaster has no prerequisite of NNM to be installed before it can be installed.

Pre-requisite to run NNM integration installer

- Need to have installed NNM 6.4 or later version
- Need to have admin privilege to run the installer
- OS supported – Windows XP, Windows 2000, Solaris 8 and 9 on SPARC (No x86 support running Solaris)

During installation installer will try to get the path for NNM from OV_MAIN_PATH environment variable and will prompt to the user to confirm or provide the right location. User will also be asked to enter default plan name that need to be used when RingMaster is launched from NNM. This plan name is inserted as an argument in the places where RingMaster is invoked in the application registration file. User needs to edit the registration file if he wants use a different plan.



Following files will be installed

- Application Registration File
 - UNIX - /etc/opt/OV/share/registration/\$LANG
 - Windows – install_dir\registration\%LANG%

- Symbol Registration File
 - UNIX - /etc/opt/OV/share/symbols/\$LANG
 - Windows – install_dir\symbols\%LANG%
- Bitmap for the switch
 - UNIX - /etc/opt/OV/share/bitmaps/\$LANG
 - Windows – install_dir\bitmaps\%LANG%
- MIB Files (Not sure of the exact location on UNIX)
 - UNIX - /etc/opt/OV/snmp_mibs
 - Windows – install_dir\snmp_mibs

Following files need to be modified during installation

- HPoid_to_sym - This file provide applications with a mapping from sysObjectID to default symbol class and type.
 - UNIX - /etc/opt/OV/conf/oid_to_sym
 - Windows – install_dir\conf\oid_to_sym
- ovw_fields – This file contains vendor specific information
 - UNIX - \$OV-FIELDS/c
 - Windows – install_dir\fields\c
- snmp_fields – This file contains SNMP agent information
 - UNIX - \$OV-FIELDS/c
 - Windows – install_dir\fields\c
- Oid_to_type – This file provides NNM with mapping from sysObjectID to default object type
 - UNIX – etc/optOV/conf
 - Windows – install_dir\conf

Once above files are updated following commands need to run to make changes effective. Following commands need to be run at the end of installation only if NNM is running. Before running following command we need to convey to the user, for the integration to take place NNM need to be re-launched and get a confirmation whether he wants installation to restart NNM.

Issue: How do we find out whether NNM is running?

ovw -fields

exit ovw

ovstop netmon

ovtopofix -u -o <sysObjectID>

ovstart netmon

ovw

- If installation fails for any reason all the changes done during installation should be reverted back to original state.
- At the end of installation PATH environment variable need to update with RingMaster executable's directory so that NNM will not have any problem launching RingMaster.
- After successful installation if user runs installation again old files should be overwritten and duplicate entries should not be created in the files that are modified during installation.
- During RingMaster installation there is no pre-requisite for NNM to be installed.

7.3 UNINSTALL

- There will be separate uninstall program that user can run anytime to uninstall NNM integration components.
- During uninstall of RingMaster user will be prompted whether he wants to uninstall NNM integration files. Upon user confirmation NNM integration uninstall will be launched to remove all the files that were copied for NNM integration.

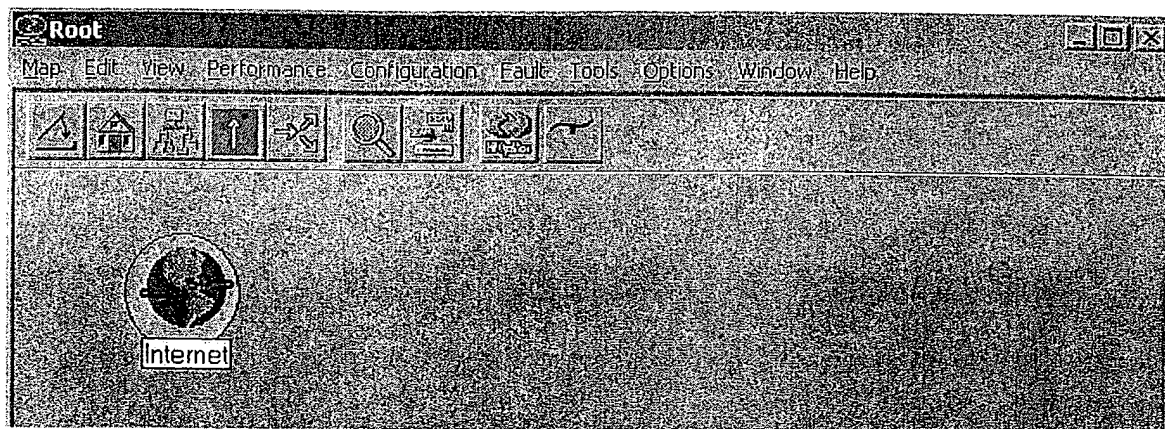
7.4 MENU AND TOOLBAR INTEGRATION

Menu and Toolbar integration is done using Application registration file. This registration file is copied to proper place during installation of NNM support. This file is loaded by NNM and parsed when NNM is started. When NNM begins initialization, it searches in various pre-defined directories for registration files. For every application of symbol type registration file found, NNM opens and parses for correctness. If the entry is valid then NNM performs appropriate operation (for example, adding a menu item in NNM menu structure or adding a button to the toolbar...etc).

7.4.1 TOOLBAR INTEGRATION

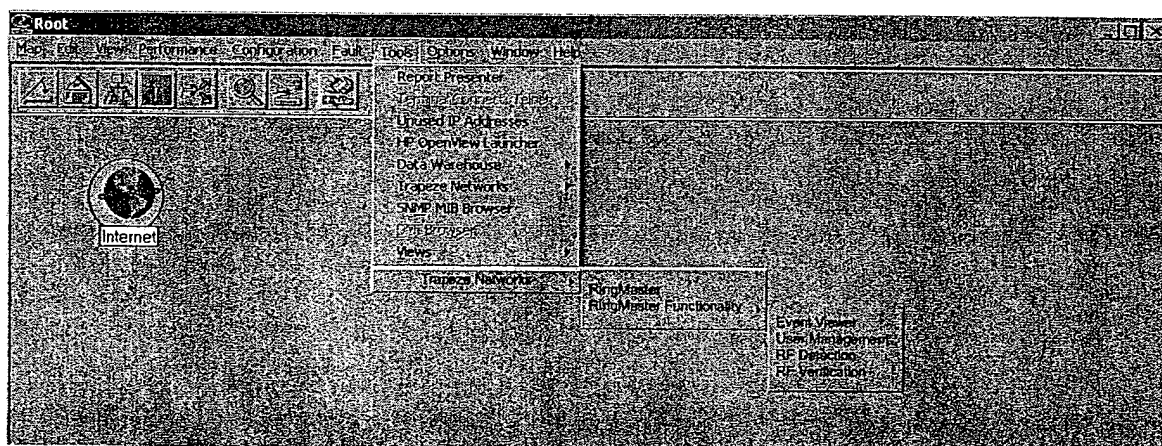
There will be a toolbar button to easily launch RingMaster for NNM. Clicking on this button launches a new instance of RingMaster if there is no instance running. To support this integration on UNIX a pixmap of 24 pixels need to be stored in \$OV-BITMAPS/\$LANG/toolbar and for windows a bitmap of 16 pixels need to be stored in install_dir\bitmaps\LANG\toolbar directory.

When RingMaster is launched from NNM we can open a default plan. This plan name can be an environment variable or stored as a part of system preference. If a default plan is not provided then user is given an option to create a new plan or open an existing plan.



7.4.2 MENU INTEGRATION

There will be a menu item under Tools menu to launch RingMaster or specific sub functionality (Event Viewer, RF Detection...etc) of RingMaster from NNM. When sub functionality is selected then RingMaster is launched first then selected sub functionality window is shown. Selecting sub functionality menu item from NNM has no effect if there is an instance of RingMaster running. There can be only one instance of RingMaster running at any time.



7.5 SYMBOL INTEGRATION

Symbols are graphical representation of objects in NNM. Symbols can either be icon or connection symbols. Icon symbols represent network or system management elements while connection symbols represent connection between elements.

We will be supporting only icon symbols. These symbols will represent MX. Symbol integration is done using symbol integration files. Each symbol is identified by its symbol type. Symbol type is defined by a symbol class/subclass pair. Symbol class defines the symbol category while subclass defines a particular element within that class.

7.6 COMMAND LINE SUPPORT IN RINGMASTER

RingMaster need to support command line arguments that are passed when it is launched from NNM. One of the arguments that are passed to RingMaster from NNM is default plan name that needs to be

shown when RingMaster comes up. Other argument could be sub functionality that needs to be shown after opening the plan.

We can use following command line flags to identify the arguments passed

- **-plan <planName>** : -plan flag indicates that following argument is the name of the plan that needs to be opened [if name is empty or null don't open the plan]
- **-function <sub functionality>** : -function flag indicates that following argument is the sub functionality that needs to be launched after opening the plan.
- Valid sub functionality values are :
 - 1 – Event Viewer
 - 2 – User Management
 - 3 – RF Detection
 - 4 – RF Verification

8 TRANSACTION MANAGEMENT

The application contains multiple background managers that require access to model data. But, these background managers cannot safely use the TxnController as an wizard/action may be in progress. With the current TxnController design, even the act of parsing XML from an external source while another operation is in progress, can corrupt the state of the model. And, for time critical data like statistics and status waiting for the wizard/action to complete is not an option.

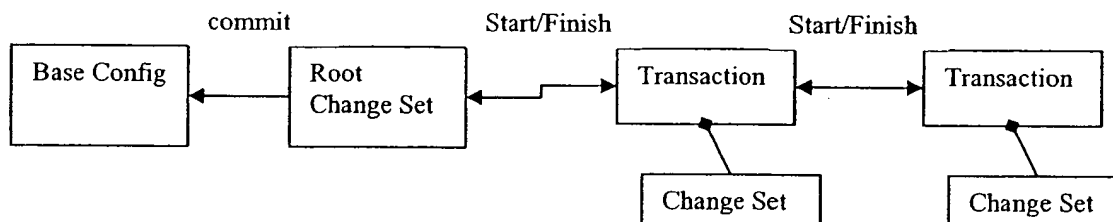
To work around this design deficiency background managers have attempted to use their own TxnController. This scheme works for parsing simple data, but falls apart when references and other relations need to be built as the parsing fails if the relation cannot be consummated. A temporary patch to solve this was to cache any needed objects in the background managers TxnController. This caching is quite expensive as a large part of the model is being replicated in the background manager (consider status collection which builds queries for all ports, APs, radios, etc.)

The proposed solution is to augment the TxnController to use a database technique called MROW (multiple readers, one writer). MROW is desirable as it allows for concurrency without complete serialization. The following sections provide an overview of how MROW can be fitted into the current TxnController with minimal impact to other clients.

8.1 USER VISIBLE FEATURES AND CHANGES

<This section needs to describe all of the user visible features that have to be modified to use the new infrastructure and ultimately what QA need to re-test>

8.2 CURRENT TRANSACTION FLOW

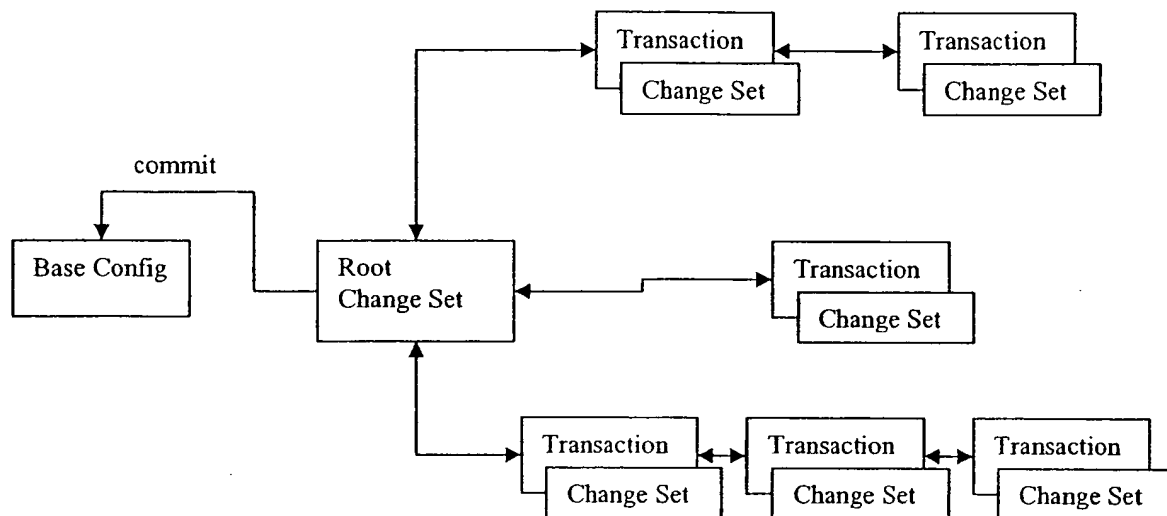


The figure above depicts the flow of a transaction with the current TxnController. As soon as any client starts a transaction, that transactions change set is visible to any other client wants to use the txn controller. This implies that no other client can use the transaction controller in isolation from the state of the original client. This is not good as it violates the "I" (isolation) in ACID, and also forces serialization of read & write operation across clients.

However, in the case of nested wizards isolation of state is not needed as each wizard wants to build on the model state of the prior wizard. This is also true, when one part of the application wants to pass-in its

state to some other part (like a common method.) Hence, any proposed change must allow for sharing of state, as well as isolation of state, depending on the needs of the application.

8.3 PROPOSED FLOW



Conceptually, the proposed change is to allow a multiple transaction chains to be branched on top of the model (base configuration & change set.) The state of each transaction chain is isolated from the other transaction chains.

A client can pass its current state to some other part of the application, allowing nesting of operations that build on prior state.

When a chain completes and its changes are to be merged to the Change Set (CS), or a commit operation is to be performed, a lock must be taken. Otherwise there is no locking or synchronization overhead.

This will allow background managers to start their own transaction chains and safely work in isolation from the rest of the application. Once they perform the necessary tasks the background managers can simply cancel their transaction chain, as they do not need to write to the model.

8.4 PROPOSED DESIGN DETAILS

The concept of isolated transaction chains solves the problem. But these need to be implemented without disrupting the current clients of the TxnController. How this can be achieved is discussed below:

8.4.1 TXN CONTROLLER SPLIT

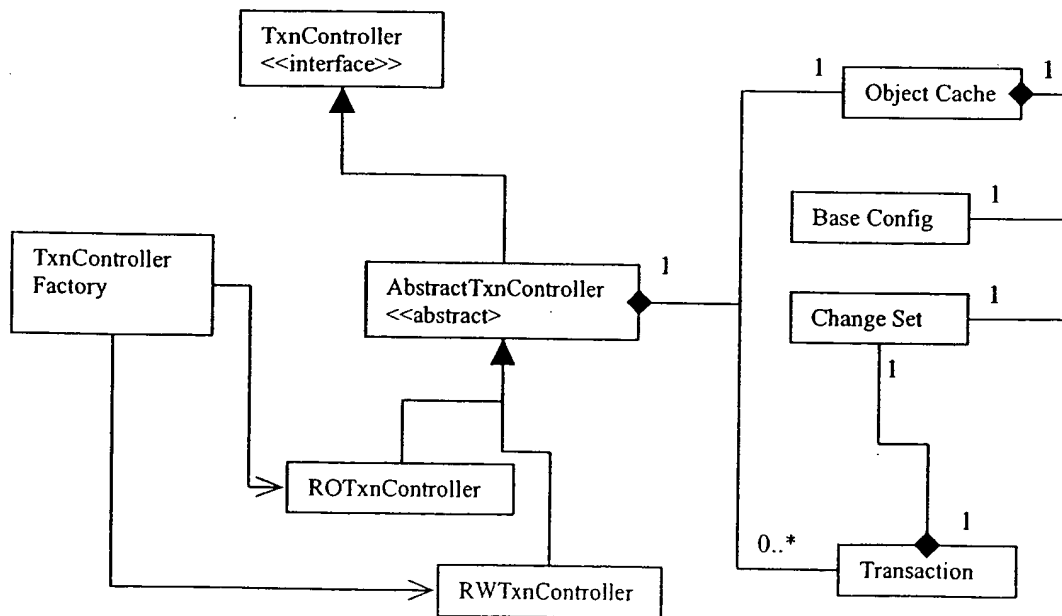
Currently the TxnController interface is implemented by a single class, the TxnControllerImpl. The TxnControllerImpl is instantiated and stored in the NmsFrame, and all other application modules access the TxnControllerImpl via the frame, and use the interface TxnController. As mentioned before, background managers contain a separate instance of the TxnControllerImpl.

The proposed design is to partition the TxnControllerImpl into two separate roles:

- a DataStore that contains the current model base and pending changes
- TxnController that can be used to manage multiple transaction chains

With the proposed design, the impact to the existing application is minimal. Using a factory, the NmsFrame will obtain an instance of the RW_TxnController. All application modules that use the “getTxnController” method will access this instance, and operate on it as before.

Background managers will use a factory to get an instance of a RO_TxnController. They can use this to read application state and safely parse network updates while wizards are active.



8.4.1.1 OBJECT CACHE

The ObjectCache is a subset of the current TxnControllerImpl. It takes over the role of keeping the common model state i.e. the base config and the change set, and is responsible for synchronizing changes to the model state.

The ObjectCache is ignorant of the currently open transactions. The ObjectCache allows multiple transaction chains to be active on top of the shared view of the data.

The ObjectCache is not visible outside of the txn controller package. It is only accessible via the TxnController.

8.4.1.2 READ-WRITE TXN CONTROLLER

The RWTxnController is a TxnController that allows changed state to be written into the RootTxnController. The RWTxnController fetches objects from the RootTxnController as needed. As changes are being made, the object is then cached within the RWTxnController itself.

When the last transaction is finished, the RWTxnController invokes a merge into the Data Store. While this is in progress, no other operations can be performed on the DataStore i.e. it is locked.

The RWTxnController also supports the “commit” call which allows model data to be moved from the Change Set to the Base Config.

8.4.1.3 READ-ONLY TXN CONTROLLER

The ROTxnController allows object level modifications, but does not allow any of these changes to be merged back to the Data Store. When a final finish is done, or a commit is invoked, any changes made in the read-only txn controller are discarded.

This implies that the ROTxnController is useful for making temporary changes. For example, when parsing device stats/status a ROTxnController can be used and once the stats objects are created client obtains and caches them as needed.

8.4.1.4 TXN CONTROLLER FACTORY

When the application is launched a Object Cache must be created, and a Txn Controller Factory must be seeded with the Data Store. The NmsFrame will cache an RWTxnController which will be used for all model changes.

The factory will be used to create multiple ROTxnController objects. Initially we can restrict the factory to produce a single RWTxnController as this helps avoid adding complex logic to handle optimistic or pessimistic object-based locking (see “What if we needed multiple writers...”)

8.4.2 COORDINATING WRITES

MROW does not prohibit multiple writers. It requires writes to be coordinated across clients so that only one client is allowed to write at a given instance in time. This is typically done using locking. There are two common variants:

- Optimistic locking: where there is an initial presumption that conflicts will *not* occur, and so no locking takes place until changes are completed and ready to be merged to the data store.
- Pessimistic locking: where locks are granted up front at various levels of granularity and while a lock is held, all other clients pend on it. This scheme is typically based on a timed lock.

There are pros-and-cons to either approach. Optimistic locking is easier on the clients, but requires more complex merge logic. Depending on the implementation details and the order in which clients finish their transactions, it can introduce some timing inconsistencies in the data (unless it rejects a merge based on a conflict.) Pessimistic locking requires more synchronization and needs clients to deal with locks and more importantly being denied locks. But, it eliminates any potential for inconsistencies.

In the current application all modules that need to update the model will coordinate their operations via the NmsFrame (using get/set busy methods.) Hence there is really no need for multiple writers. To leverage this, instead of requiring any synchronization or merge logic, we can enforce the single writer by having the factory/frame only contain a single instance of the RW_TxnController. If & when needed, this scheme can be seamlessly extended to support multiple writers and the proper write coordination logic.

8.5 FUTURE APPLICATIONS....

8.5.1 WHAT IF WE WENT CLIENT/SERVER

The proposed design can adapt well to a distributed model. Each client can have one or more of its own read-only or read-write TxnController instances and the Data Store can reside in the server.

By performing all object operations locally, and without any synchronization overhead, clients can be extremely efficient. When changes are ready to be merged, an entire Change Set can be transferred back to the server.

8.6 DELIVERABLES & ESIMATES

8.6.1 GENERAL

With the new design, all background tasks can be safely performed using a ROTxnController. A client that wants to process a network response in the background can use a ROTxnController to parse the XML and create RTime objects. Once these are parsed they can be cached in the StateMonitor or propagated back to other modules, like in the case of stats collection.

The DeviceStatManager, OperStatusPropogator and Client management module need to be updated to do this.

8.6.2 CLIENT MANAGEMENT

The client management module uses a mix of dynamic and configuration data. For background tasks it needs to be updated to use a ROTxnController (like the DeviceStatManager, etc.)

Here is an initial analysis of the changes necessary for this module:

- We need to have a ClientMgr singleton object which maintains a ROTxnController. ClientMgr will be instantiated whenever a user opens a new plan and disposed whenever a plan is closed.

- ClientMgr will open a long transaction using a ROTxnController instance, and will listen to APRadio delete events since it actually establishes the reference relations from current user location to the AP radio. If a radio is deleted, the ClientMgr's ROTxnController will need to be updated.
- ClientMgtPanel and FindUserWizard will both use this ROTxnController to do create and delete or modify of the user sessions and user locations whenever we perform find Users, or polling users from background
- ClientMgtPanel will no longer need to cache the data, and it will use the ROTxnController to update the user session and user location data. And when it is doing background polling, it will not need to set the frame to be busy since it is operating on a different transaction controller.
- Since ShowUserLocation() method in ClientMgtPanel sends FloorLayoutEventData to FloorMdlView, this event data will need to have slight interface change to pass in session label, rssi, and AP radio key (which MX, MP, and Radio Slot) instead of passing session id and radio id. This is because the session now is no longer created in the main RWTxnController; we need to de-couple the usage of the id.

8.6.3 ESTIMATES

(Estimates include unit testing)

1. Infrastructure changes (with single RWTxnController support) – 5 days
2. Devif - DeviceStatManager changes – 2 days
3. Oper Status Propagator changes – 1 day
4. Client management/Find Client - (3 days)

9 VERSIONING

Moving forward Ringmaster will need to support multiple versions of software and maintain a level of compatibility between them.

9.1 XML CONVERSION

9.1.1 DEVICE DTD COMPATIBILITY

9.1.1.1 PATCH RELEASES

For patch releases a DTD needs to be backward compatible. That implies that a 1.0.x+1 DTD must be able to validate a 1.0.x XML.

In order to achieve this some rules must be followed:

- Only optional attributes can be added
- Only optional elements can be added, and they must be at the end i.e. no change in document order for existing elements.
- No other changes are allowed

9.1.1.2 MAJOR/MINOR RELEASES

Need to clarify what is supported. Possible changes???

- attribute is added
- attribute is removed
- attribute is modified
 - Type changes
 - Range changes:
 - Enum list extended
 - Enum list shortened
 - Numerical ranges?
 - String lengths?
- element is moved
- element is removed

- element is added

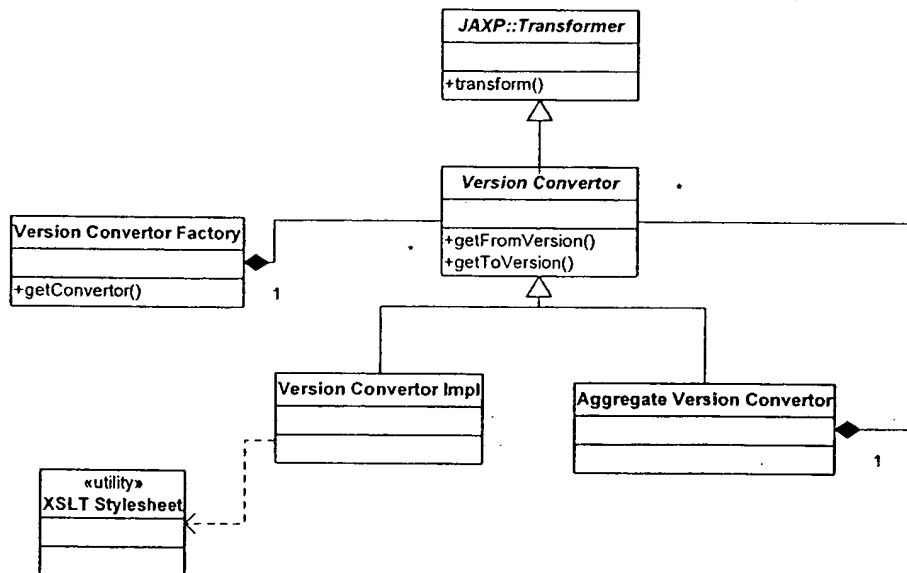
9.1.2 VERSION CONVERTORS

The proposal is to develop a set of version converters which will be implemented as JAXP Transformer instances (see JAXP documentation) to convert between various versions of the XML. Each transformer will transform the XML between two immediate versions. For future conversions across multiple versions transformers can be chained together.

A transformer will typically be implemented by an XSLT stylesheet. Each stylesheet can consist of multiple templates (templates are like procedures in XSLT) for various conversions.

A transformer can also have an implementation that converts directly between two DOMs i.e. it is not required to be a XSLT stylesheet.

For example, the policy data may change between 1.0.0 & 1.0.1. To handle this, a “1.0.0 to 1.0.1” transformer will be created and registered in a Transformer Factory. When a client module encounters a 1.0.0 XML and wants to convert it to 1.0.1, it will lookup this transformer and will run it to produce a 1.0.1 XML.



Depending on how complex the conversion is we can also support an aggregation of converters for a single conversion. So for example, assume that a conversion has the above mentioned policy changes and also has a new AAA/userglob hierarchy. We can develop independent Version Convertors for each conversion, and then somehow aggregate them together for the full conversion. If we find the conversion getting too complex, this approach may help in breaking it into simpler pieces.

10 RULES SUPPORT

We have added additional support for Rules Check in RingMaster release 1.1. For details, please refer to the Rules-Spec document. Here is only a summary of a list of rules added for release 1.1:

1. Accounting for MAC Network Access is not supported. (Error)
2. AAA User/UserGroup, Mac User/Mac UserGroup Attributes validation:
 - a. Mobility-Domain Profile should exist in the device (Warning)
 - b. Service-Type needs to be numeric value (1-11) (Error)
 - c. Encryption-Type needs to be numeric value (0-64) (Error)
 - d. Session-Timeout needs to be non-negative number (>0) (Error)
 - e. Idle-timeout needs to be non-negative number (0-65535) (Error)
 - f. Filter-id needs to postfix with either *.in or *.out (Error)
3. AAA Radius Server "key" should be set if Radius Default did not set the default for "key" (Warning)
4. AAA Radius Server can not have ip addresss as 0.0.0.0 (Error)
5. Mobility-Profile should contain at least 1 port group reference if the mode is defined as Selected. (Error)
6. ManagementServices Sys Log should have maximum of 4 log servers. (Error)
7. ACL name should start with alphabetical characaters.
8. ACL name should not contain the following terms: **all, default-action, map, help, editbuffer**

11 MISC CONFIG SUPPORT

We have also added the configuration support in R1.1 for the following (was unsupported in R1.0):

- VR-ARP configuration: One can now configure VR-ARP agingTime, and ARP Entries (hw-addr, and ip-addr), deploy, and review network changes etc.
- Trace-Table configuration. One can now configure Trace-Table, setting up different trace area, levels, deploy, and review network changes etc.

12 EVENT VIEWER ENHANCEMENTS

Several new features will be added to to the event viewer in R1.1

- The user must be provided with the ability to enable or disable the auto-refresh functionality.
- The user must be able to specify AND and OR conditions when specifying text search criteria in the event filters.
- A function to find a string within a message must be provided in the detailed view dialog.
-

13 APPENDIX

13.1 NNM APPLICATION REGISTRATION FILE DEFINITION

Application registration files are used to integrate network and systems management applications with the NNM user interface. Many aspects of an application's integration are defined using an application registration file (ARF). Application registration files provide NNM with important information such as:

- How to integrate the application into the NNM menu and Toolbar structure
- How to invoke the application based on the user's run-time selection of menu items

Ex:

Application "RingMaster"

```
{  
  
    /*  
  
        ** APPLICATION DESCRIPTION  
  
    */  
  
    DisplayString "Trapeze Networks Planning Tool"  
    Version "RingMaster 1.0"  
    Description {  
        "Description....."  
    }  
    Copyright {  
        "Copyright information ...."  
    }  
  
    /*  
  
        ** COMMAND BLOCK  
  
    */  
  
    /*  
  
        ** Valid Process_flags are Initial, Shared and Restart  
  
    */
```

```
Command -[process_flags] "command_name" $environment_variable;

/*

** MENU BLOCK

*/

MenuBar <100> "Tools" _T

{

    <10> "Trapeze Networks" _z Context (AllContexts) f.menu
    "trapeze";

}

Menu "Trapeze Networks"

{

    <100> "Ring Master" _R Context (AllContexts) f.action "ringmaster";
    <90> "Event Viewer" _E Context (AllContexts) f.action "eventviewer";
    <80> "RF Detection" _D Context (AllContexts) f.action "rfdetection";
    <70> "Client Management" _C Context (AllContexts) f.action
    "clientmanagement";

}

/*

** TOOLBAR BLOCK

*/

ToolBarButton <50> @"toolbar/ringmaster.bmp, RingMaster"

Context "AllContexts" f.action "ringmaster"

/*

** SYMBOL POPUP MENU BLOCK

*/
```

```
    PopupItem <100> "RingMaster"

    Context AllContexts

    TargetSymbolType "Net Device":"Trapeze MX-20 switch"

    f.action "ringmaster";

PopupItem <90> "Event Viewer"

    Context AllContexts

    TargetSymbolType "Net Device":"Target MX-20 switch"

    f.action "eventviewer";

PopupItem <80> "RF Detection"

    Context AllContexts

    TargetSymbolType "Net Device":"Target MX-20 switch"

    f.action "rfdetection";

PopupItem <70> "Client Management"

    Context AllContexts

    TargetSymbolType "Net Device":"Target MX-20 switch"

    f.action "clientmanagement"

/*
** ACTION BLOCK
*/

Action "ringmaster"
{
    Command -shared "ringmaster" -p $NNM_RM_DEFAULT_PLAN ;
}

Action "eventviewer"
{
    Command -shared "ringmaster" -p $NNM_RM_DEFAULT_PLAN -f "event";
```

```
}  
  
Action "rfdetection"  
  
{  
  
    Command -shared "ringmaster" -p $NNM_RM_DEFAULT_PLAN -f  
    "rfdetection"  
  
}  
  
Action "clientmanagement"  
  
{  
  
    Command -shared "ringmaster" -p $NNM_RM_DEFAULT_PLAN -f  
    "clientmanagement"  
  
}
```

NNM SYMBOL REGISTRATION FILE DEFINITION

SymbolType "class Name" : "subclass Name"

```
{  
  
    Filebase "symbol_class_icon_base_name";  
  
    CursorSize n;  
  
    DisplayString "localizable String";  
  
}
```

Ex:

SymbolType "Connector" : "Trapeze MX-20 Switch"

```
{  
  
    Filebase "trpzmx20";  
  
    CursorSize 38;  
  
    DisplayString "Trapeze Networks MX-20 switch";  
  
}
```

In the above symbol subclass definition subclass name needs to be unique.

Filebase defines the base name for a symbol subclass. It is provided in a file with the format filebase.size.extension. Symbol class icon can be an X bitmap or X pixmap. Pixmap is a supported format for UNIX and Windows.

Bitmap definition is composed of two parts filebase.size.p (the bitmap) and filebase.size.m (the bitmap mask). Pair of bitmap/bitmap mask file pair should be provided for each bitmap size. Recommended symbol subclass icon sizes (in pixels): 20X20, 26X26, 32X32, 38X38, 44X44 and 50X50. All icons for a subclass must be of the same format. Pixmap definition consists of simply filebase.size.pm because the mask is defined in the pixmap (Need to investigate whether GIF or JPEG can be used instead of pixmap or bitmap files)

CursorSize entry defines the size of the bitmap to be used as the cursor. CursorSize is also used during drag and drop operation. Recommended cursor size is 38X38.

RINGMASTER 2.0 FUNCTIONAL SPECIFICATION

PROJECT NAME "WHATEVER"

Revision 0.12

[REDACTED]

AUTHORS: RingMaster Engineering

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Revision	Who	Date	Description
0.1	Allan		Original
0.2	Sudhir		Begin DMP support section
0.3	Kishan		Updated impact RF planning section
0.4	Kishan		Updated RF Planning section
0.5	Kishan		Updated RF planning section
0.6	Sudhir		Updates to DMP section
0.7	Jim		MX-6 details
0.8	Sudhir		Added screen shots to depict management of MP connection information
0.9	Jim		Screen shots & updates for MX-6 CM & image sections
0.10	Jim		Updates from review with Allan
0.11	Sudhir		Merged back the working copy
0.12	Kishan		Updates from review with Allan

1 INTRODUCTION

1.1 GOALS AND SCOPE

The goal of this document is provide a functional specification of the changes to RingMaster for Version 2.0.

The following main features are targeted for 2.0:

- MX-6/MX-400 Support
- Intermediate L2/L3 MP Support
- Policy Management Changes

2 NEW DEVICE SUPPORT (MX-6, MX-400)

2.1 OVERVIEW

The MX-6 is a smaller version of the MX-20, with 8 ports (6 fast Ethernet and 2 gig-ethernet.) The MX-400 is a 4 gig-port chassis. From a software perspective the MX-6 & MX-400 are the same as the MX-20. Please refer to the appropriate PDDs for more product details. These are available at:

<http://intranet.trpz.com/highwire/productmgmt/PDD/v2.0/>

The following sections elaborate on the areas of Ringmaster that need to be changed to handle the new MX types.

2.2 CONFIGURATION MANAGEMENT

2.2.1 DTD CHANGES

~~This needs to be co-ordinated with the NOS team~~

The DTD needs to be modified to have a chassis type attribute as part of the boot status. Ringmaster will use this attribute wherever it needs to check the network type (e.g. Topology reports, deploy, upload, etc.) This is similar to how the version is read & processed today.

2.2.2 MODEL CHANGES

There are no new classes for the new device types. The existing Chassis class and the existing Network Plan -> Device relation will be used to model MX-6 & MX-400 instances. Note that this implies that the chassis names are unique across all types of chassis.

There is currently a "MX Model" RO attribute on the device, that displays the system description value. This will now be used as a RC attribute that allows the user to select an MX model. The system description will be shown in the SNMP properties (as it is also done today.) The MX model will be an NMS only attribute i.e. not part of a deployable config.

New Device Descriptors will need to be created for each type of MX.

2.2.3 VERSIONING

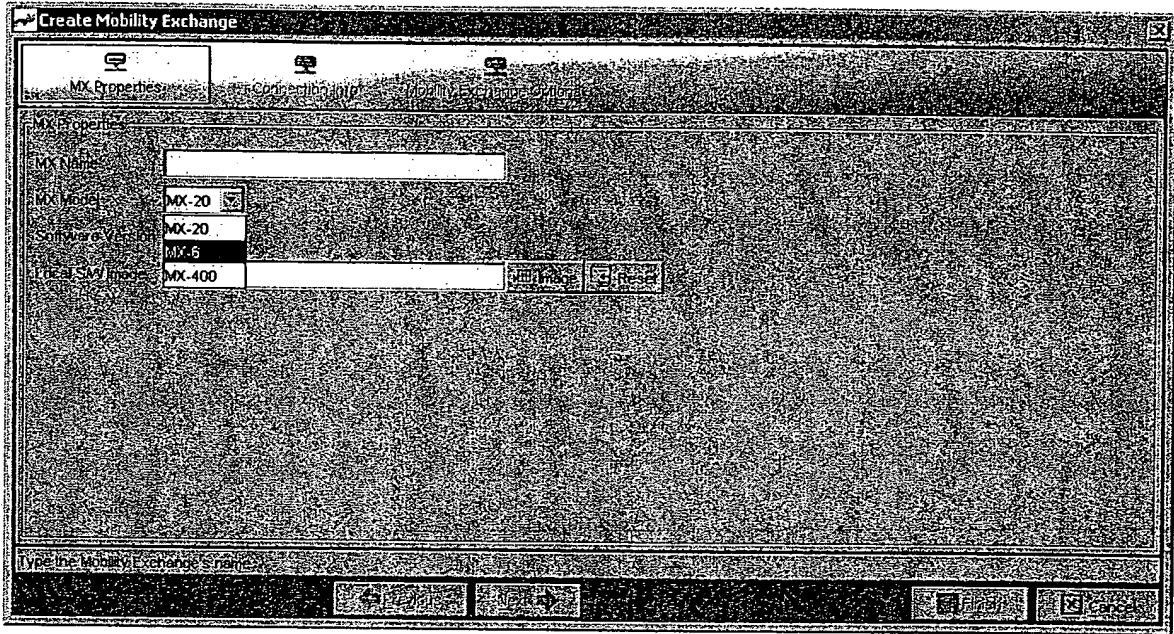
The MX-6 & MX-400 will only allow v2.0 and up (see table).

	1.0	1.1	2.0
MX-20	Y	Y	Y
MX-6	N	N	Y
MX-400	N	N	Y

Since the same model classes are used for all types of chassis', the allowed configurable software versions for the MX-6 & MX-20 will be different based on the instance type (controlled via "getValidChoices".)

2.2.4 MX CREATION – LOCAL

Users will now need to specify which type of chassis they wish to create. Based on the selected option, the right Device Descriptor will be used to create the default objects for the chassis.



Internally, when the chassis type is selected a default Chassis object is created and set as the context.

NOTE: If the user comes back to this page and selects a different MX type, the context will be deleted and re-created.

2.2.5 MX CREATION – UPLOAD

During an upload, Ringmaster will determine what type & version of chassis to create based on the system boot status returned from the MX. Once a chassis is created, the XML config is mapped on to it.

2.2.6 MX CREATION – OTHER (OPEN PLAN, IMPORT, PASTE, ETC.)

When opening a plan, Ringmaster will use an NMS-only "chassis-type" attribute to determine the type of chassis to create. The same approach will be used for a paste.

For an import or a paste-replace where the device already exists, its type will not be changed but the data will be applied. More details on this in subsequent sections.

2.2.7 CHASSIS MODIFICATION

The user will *not* be allowed to change the type of a chassis after it is created (i.e. the create wizard is finished.) Within the create wizard the user can go back to the chassis selection page and start over.

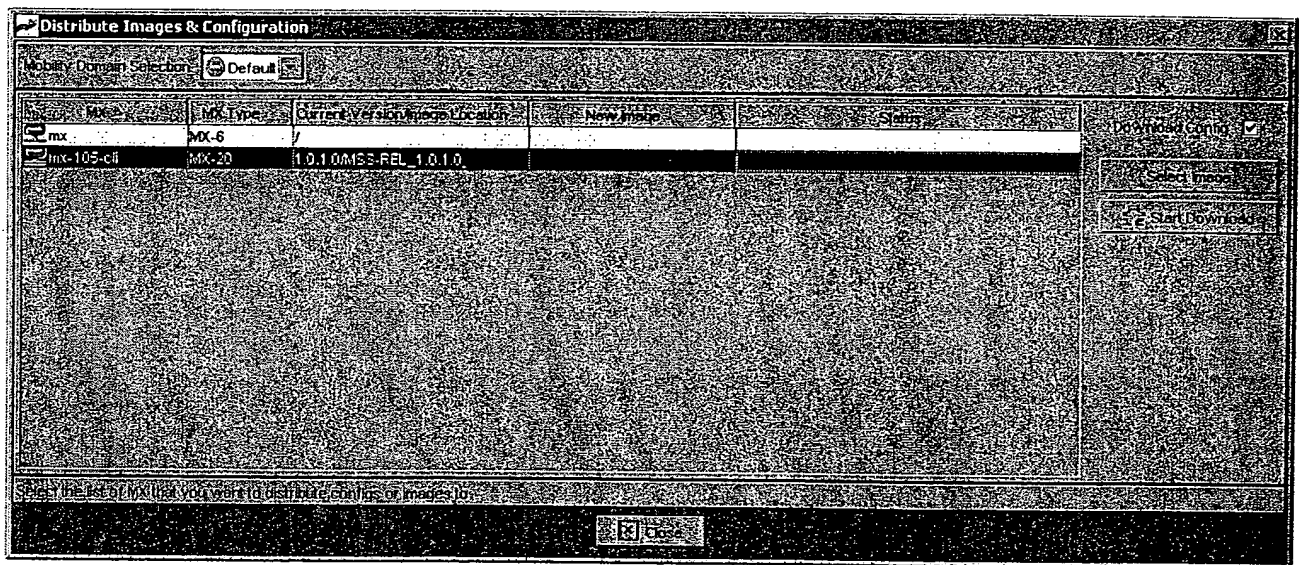
2.2.8 NETWORK SYNCHRONIZATION

RingMaster will only allow network changes to be applied to the plan if the type of the MX in both the network and RingMaster configuration are the same. If network changes are detected, but the types are different, the Network Status field in the Local & Network Changes view will indicate the model mismatch and the apply button will be disabled for that MX.

2.2.9 DEPLOY & DISTRIBUTE IMAGE/CONFIG

When sending configuration and images to the network, Ringmaster will check and verify the device type. This will be done along with the existing license & version checks, before any configuration is sent. If there is a mismatch, an error will be shown and the operation will fail

The image distribution and configuration page will need to be modified in way that the image selection button is disabled whenever the user selects multiple MX's of different types. A new MX type column will be added to help the user properly select multiple MX's.



2.2.9.1 BUTTON/UI CHANGES

Both the Deploy & the Distribute Images & Configuration have some UI issues.

The Deploy page has a button on the top right. This should be moved to the side or the bottom. The Distribute Images & Config has the "Start Download" button on the side. This should be moved to the bottom panel.

2.2.10 XML MAPPING IMPLEMENTATION NOTES

This behaviour is common to all functions like copy & paste/paste-replace, import, upload, etc.

Although a device type cannot be changed via parsing XML, any configuration can be parsed onto any type of device. Hence, the XML mappers will have to be flexible enough to handle parsing of data that may not be completely valid in a best-effort manner.

The main issue is with port references, which can be used in VLANs, ACL Maps, etc. So if a MX-20 VLAN containing port references to port 10 is copied to an MX-6 the expectation is that the VLAN will be properly copied but the VLAN-PORT that is invalid in the target will be ignored. The way this can be handled is if the key reference is not resolved, the mappers do not create the containing object (like VLAN-PORT.)

2.2.11 COPY/PASTE/PASTE REPLACE

RingMaster provides useful features to allow the user to copy/paste/paste replace configurations within the supported configuration elements of the network. It is required for the user to be able to copy/paste/paste-replace between heterogeneous MX types. That is, the user should be able to copy and paste a VLAN from an MX-20 to an MX-6. Similarly, a user should be able to paste-replace from an MX-20 to an MX-6 without any significant problems.

The device type attribute will not be applied as the type of an existing device cannot be changed via a copy & paste-replace. For a paste that creates a new device, the type will be the same as the source device.

Just as with copying and pasting across versions, copying and pasting across types will be best effort. This means that only data that is valid in the target will be applied. So, in the VLAN example above if the source VLAN contains port references that are not valid in the target device, these will not be created.

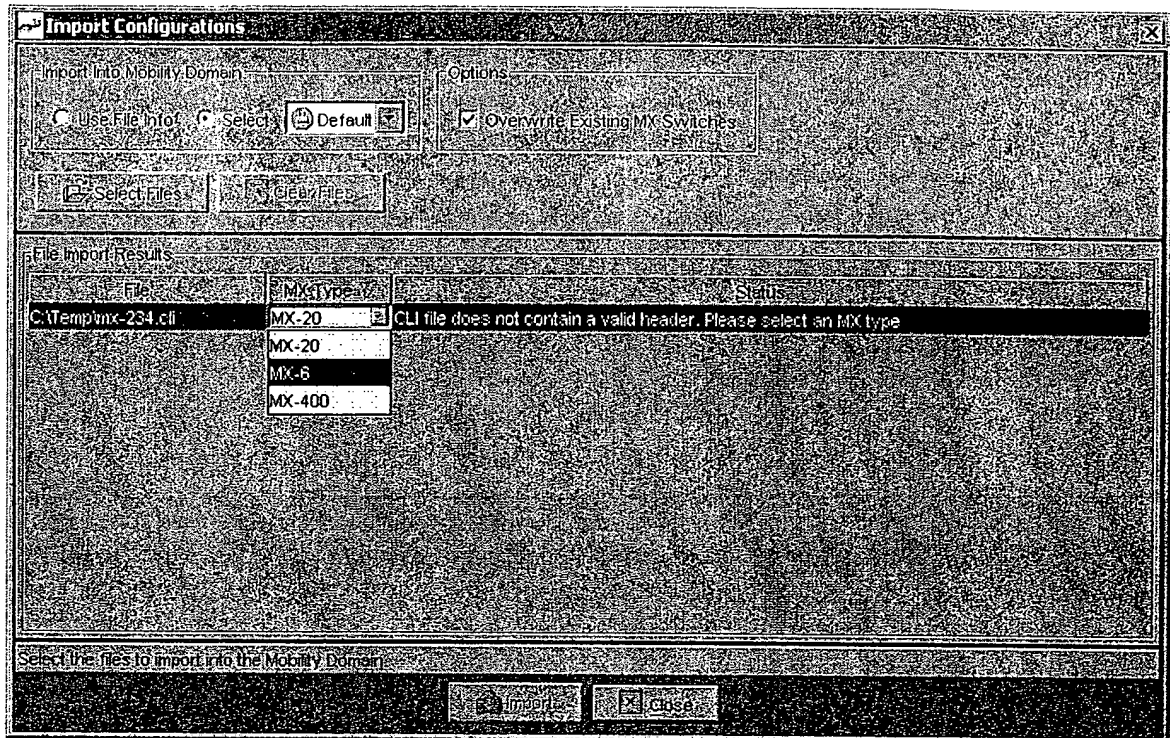
For ports, the configuration will be aligned based on port type and port number. This means that based on the incoming chassis type, the target chassis type, and the incoming port number there will be a best effort attempt to calculate the target port and apply the configuration to it.

[On a paste-replace/paste, it is desirable to show the user what configuration was not applied. This could be done as an initial progress page of the edit wizard that is displayed after the paste. However, there is no good way to determine what data was not transferred. Needs more thought/research.]

2.2.12 CONFIGURATION FILE IMPORT

The CLI-based configuration must include a type discriminator to allow RingMaster to build the correct chassis type. This has traditionally been done by a standard comment field at the top of the CLI-based file. We need to define such a standard and incorporate support for this into RingMaster.

When a file is selected, and if it is a CLI file Ringmaster will parse the header and determine the type. If the header is missing, or not properly formatted the user will need to select the device type. For XML files, Ringmaster will use the number & type of ports to determine the chassis type. In either case, the user can always change the device type.



2.2.12.1 OVERWRITE EXISTING MX SWITCHES

Currently, the overwrite option really does a merge. This will be modified to make the device config look exactly as in the imported file. *This implies that a partial configuration can no longer be applied to an existing device.*

If the overwrite option is selected, and the MX types do not match the import will fail.

2.2.12.2 CLI HEADER FORMAT

~~This needs to be co-ordinated with the NOS team~~

Here is a proposal for the CLI header (only the "Model" line is new):

```
# Configuration nvgen'd at [REDACTED] 15:32:08
# Image 1.1.0.67
# Model MX-400
# Last change occurred at [REDACTED] 18:12:12
```

2.2.13 CONFIGURATION FILE EXPORT

RingMaster provides the user with the ability to export CLI-based configuration files. It must be extended to enable creation of configuration files for the MX-6 & MX-400, including the standard type header for the file that specifies the MX type.

2.2.13.1 VERIFICATION ON EXPORT

Currently we do not run rules on export of configuration. When the user selects the export option, just as in the deploy wizard, we should run the verification rules and display any errors. The display could be done as a separate "View Errors/Warnings" button on the export dialog. The same preferences that are used today will be used to control whether a configuration with errors can be exported etc.

It would be nice to show the error on a per device basis, and only enable/disable export of that device. This would require some modifications to the verification engine as currently there is no way to request verification on certain sub-trees.

2.2.14 VERIFICATION/RULES ENGINE

Other than the physical port count, Ringmaster will not impose configuration limits on VLANs, ACLs, etc.

Ringmaster will have logic to restrict the Distributed AP count for different types of MXs. This is covered in the section for the L2/L3 MP support.

2.3 IMAGE MANAGEMENT

2.3.1 IMAGE FILE

~~This needs to be co-ordinated with the NOS team~~

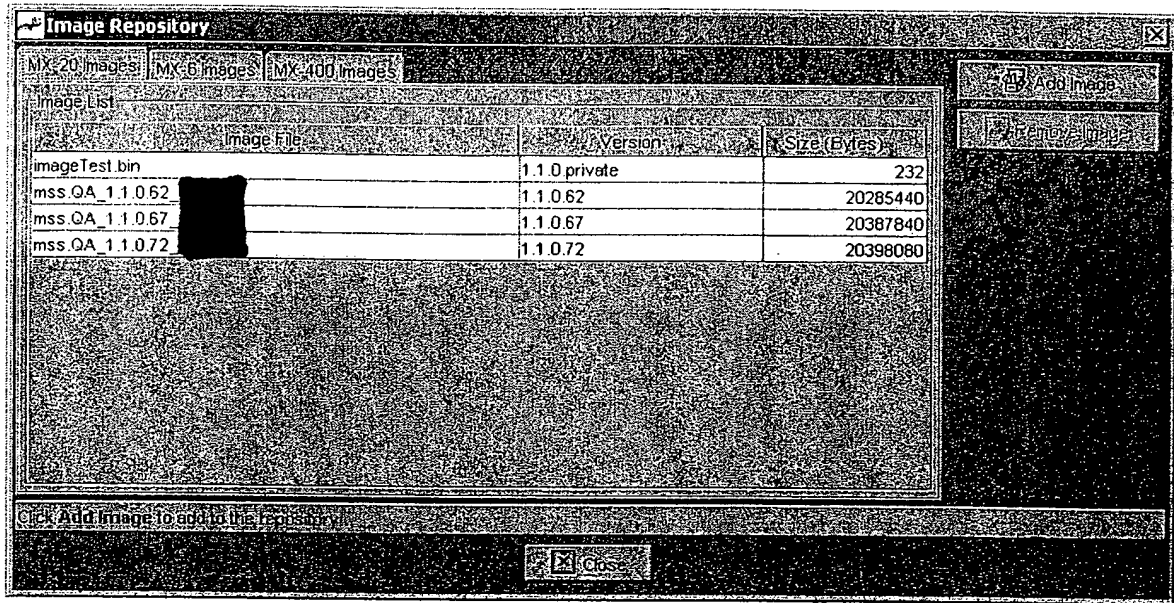
The embedded XML header in the image file will need to be modified to include a device type. The image file parser will read this and hence be able to determine what type of chassis an image is for. Ringmaster will also need to handle the case where the model is missing i.e. for 1.0 and 1.1 images. These will be assumed to be MX-20 images. (The case where a 2.0+ image is missing this information is an error.)

The proposed format is:

```
<image-identifier product="MX" model="MX-20" version="1.1.0.76  
label="QA_1.1.0.76_██████" filename="MX010100.020"> </image-identifier>
```

2.3.2 IMAGE REPOSITORY

The image repository will need to be extended to manage images for the new MX types. When adding an image, RingMaster will need to detect the type manage it accordingly. When the user configures an image for a chassis, only images that match the chassis type will be shown.



2.3.3 IMAGE CONFIGURATION

When the user selects an image for an MX, only the images that map to the MX model should be shown. This implies that the image repository will need to support functions to retrieve images by MX model.

2.4 PERFORMANCE MANAGEMENT

The following sections outline the changes that will be required for MX-6 support in the area of performance management.

2.4.1 PERFORMANCE DATA AGGREGATION

There is no user-level change for the PM aggregation. However, there are places where the implementation will need to be updated to not assume 20+2 ports.

2.5 FAULT MANAGEMENT

The following sections outline the changes that will be required for MX-6 support in the area of fault management.

2.5.1 OPERATIONAL STATUS MONITORING

Similar to the performance aggregation, there are no user visible changes but there will be code updates to not assume a 20+2 port configuration.

2.6 POLICY MANAGEMENT

NOTE: There are significant changes proposed for policy management in a different section of this document. Here for the purpose of decoupling the two features we describe how the current policy management scheme can work for the MX-6 with no changes.

The current policy management scheme assumes that the policy is an MX-20 device. For other functions like copy-paste, import, etc. the XML mappers will need to do be flexible enough to handle applying MX-20 data to an MX-6. Hence, when a policy is applied to an MX-6 only data that is valid for the MX-6 will show up as changed. This is also how the current policy scheme works for different versions.

Note that even with all of the proposed policy changes, we will need to handle cases where a user defines a VLAN policy without policy-criteria (in which case it would need to be based on a superset of all possible configurations.)

2.7 RF PLANNING

As part of the design constraints, RingMaster RF Planning will require the user to now select the appropriate chassis type they wish to deploy in their network.

The algorithms which try to determine and allocate ports now must take account of the chassis type and the various port configurations.

~~At this time, we are assuming that there is no requirements for Ringmaster to try and recommend a chassis type. Need to verify this.~~

2.8 RF DETECTION

RF Sweeps may be considerably different when the MX-6 ships due to the lower-cost hardware and limitations. Therefore it is expected that there may be additional software required in RF detection control and configuration for this new hardware. At a minimum, the RF detection wizards and results pages must be able to handle different chassis types and possibly results.

2.9 REPORTS

The following sections outline the changes that will be required for MX-6 support in the area of reports.

2.9.1 NETWORK TOPOLOGY VERIFICATION

Network topology verification is an important feature in RingMaster that becomes more important as different chassis types can exist in the network. Verifying that the MX type matches the network plan...etc is an important extension of this logic.

2.9.2 INVENTORY REPORT

The inventory report will need to identify the MX type for all chassis listed.

2.9.3 WORK ORDER

RingMaster work-order generation will require additional features to show the user chassis types as part of the report.

2.10 ESTIMATES

Task	Estimate (Days)
DP Simulator changes (boot status, etc.)	1
Model Changes, Versioning and MX Creation	5
MX Upload	2
Deploy (+button/UI changes)	2
Distribute Image/Config (+button/UI changes)	2
Devif updates to retrieve & cache MX type.	1
Change Management (Accept changes)	1
XML Mapping to map ports across devices	2
Copy & Paste/Paste-Replace	5
Import & Export	4
Verification on Export	3
Image Management	3
PM & Oper Status	2
RF Planning – port allocation	1
RF Detection	??
Network Topology Report	2
Inventory Report & Work Order	2

3 DISTRIBUTED MP (DMP) SUPPORT

3.1 OVERVIEW

The significant change to the management model for support of MX/MP separated by an intervening L2 or L3 network is related to the pre-configuration steps the customer now has to perform.

This section will define the changes to and impact on RingMaster with the introduction of Distributed MP (DMP).

3.1.1 FEATURE SUMMARY

The complete details of feature requirements are in the

http://intranet.trpz.com/highwire/productmgmt/PDD/v2.0/IntermediateL2_L3.pdf

The goal is to integrate Distributed MPs into RingMaster seamlessly ensuring all features of RingMaster function normally.

To summarize the features in RingMaster perspective:

- Ability to configure a DMP
- Ability to configure n- Redundancy for a MP
- Ability to plan with incomplete DMP configuration
- Ability to update the MP configuration from its announce status
- Ability to monitor MP that has at least one "indirect-connection"

3.1.2 DISTRIBUTED MOBILITY POINT (DMP)

A DMP is an access point connected to a MX port with an L2/L3 network in-between them. It is the ability to allow users to place Access Points in remote locations where the Ethernet cable length limit of 100 meters is an issue.

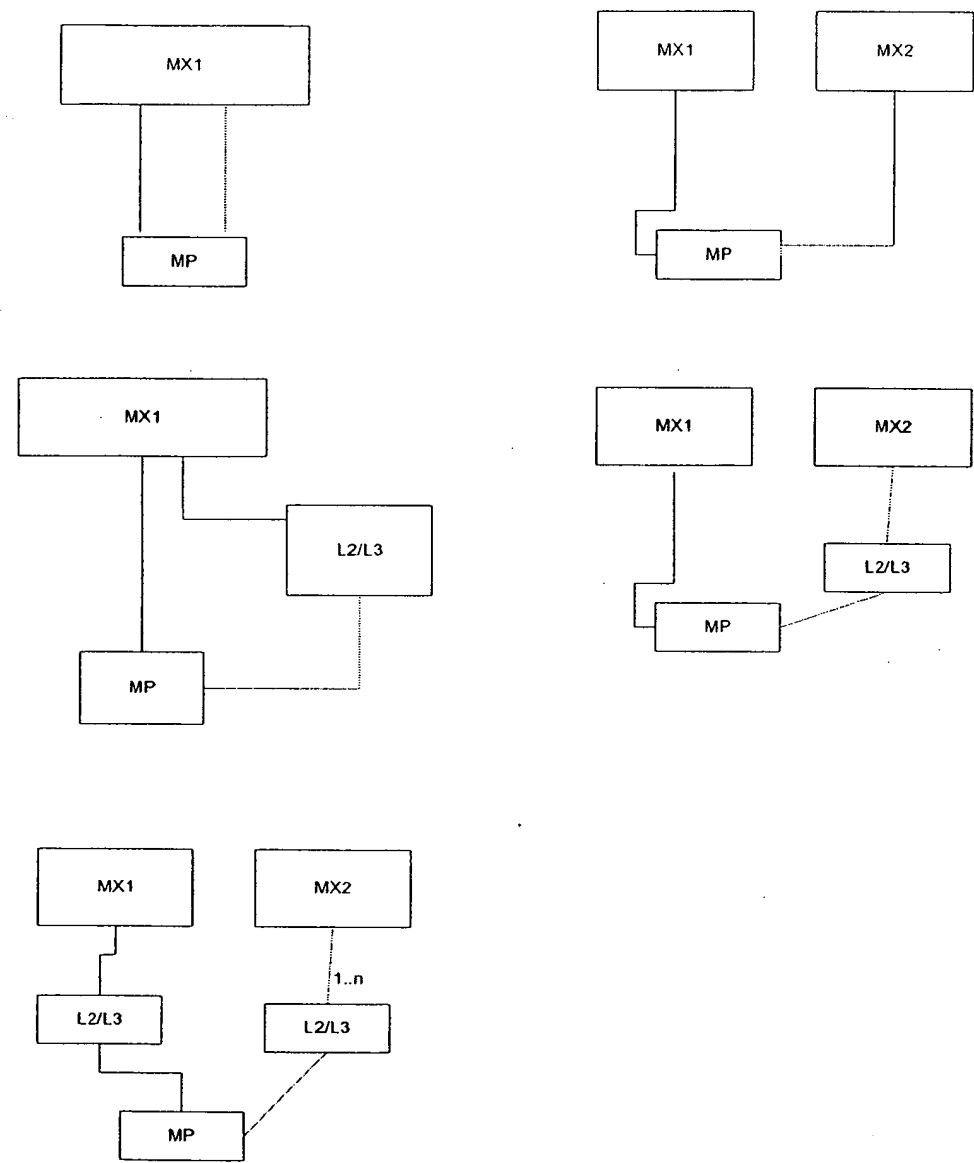
Simply put, an Access Point is a DMP, if it is not directly attached to a physical port;

Typical usage of DMP is to place in remote offices, where 1 or two access points are required and it is dangerous or management nightmare to place a MX in a wiring closet.

DMP is just like another MP. RingMaster will not distinguish between them, except when it comes to deploy such configurations as certain information will be required for MP to receive its configuration from the MX. The user will continue to define an Access Point, the way it is currently defined. The only difference being that the user needs to make it clear when configuring MP on a MX, if it is connected to a physical numbered port or if it is a DMP.

In this document, a "direct-connect" indicates that the MP is directly connected to a MX port. And similarly, a "indirect-connect" indicates that the MP is indirectly connected to the MX via a L2/L3 network

The types of connection a MP can now have are as follows:



3.2 USE CASES

The two ways of configuring MPs, i.e.; RF Planning tool or manual MP configuration will continue to be supported with the introduction of DMP. As always, creating new MP configurations is recommended by using the RF Planning tool.

In order for RF Planning tool to be able to generate MP Configurations, it will need some information in addition to what is requested in the current release.

3.2.1 USAGE OF RF PLANNING TOOL

The work flow of using RF Planning tool will be as follows:

1. User draws coverage area and provides its details.
2. User manages Design Constraints on the Coverage Area before attempting “compute and place”
3. Upon Compute and Place, the RF Planning tool will create MP with “direct-connection” or “indirect-connection” to MXs. The planning tool will also add the desired redundancy to the MP.

3.2.2 DEPLOYING DMP CONFIGURATIONS

1. The user creates MP with one or more “indirect-connections” either manually or using RF Planning tool.
2. The user specifies the “mandatory” serial number for each MP that has at least one “indirect-connection”
3. The user deploys the MP configuration

3.2.3 MANAGING DESIGN CONSTRAINTS

As in the current release, the user has no flexibility of managing Design Constraints per Coverage Area with 2.0; RingMaster will allow the user to manage the constraints at an area level. More details about this can be found in section Enhancements to RF Planning. The ways to manage design constraints will be as follows:

1. User clicks on Manage Constraints action
2. User applies certain constraints to selective Coverage Areas.
3. User edits a Coverage Area
4. User modifies the Design Constraints of the area independently.

3.2.4 CREATE A NEW DISTRIBUTED MP

To distinguish from creation of a “direct-connect” MP in Ports Wizard, the user will be able to create a DMP in a particular device. However, the user will not be able to add redundancy to the MP while creating the DMP. The user will have to edit the DMP to add /remove / move redundancy.

3.2.5 MANAGING MP CONNECTION INFORMATION

1. The user edits the MP
2. The user adds/modifies/removes redundancy to MP connection by adding/modifying/removing “connection information”

3.2.6 UPLOAD DMP CONFIGURATION

1. The user creates a DMP configuration on CLI
2. The user uploads the configuration from MX into RingMaster
3. RingMaster creates a Distributed MP for any DMP configurations found.

3.2.7 CLI IMPORT/EXPORT

RingMaster will be able to handle export and import of Distributed MP just like any other piece of configuration.

3.2.8 COPY/PASTE/PASTE-REPLACE

The user will be able to copy/paste a Distributed MP on another Distributed MP, but not on an AP object shown under “Ports/APs” folder.

3.2.9 REBOOT DIALOG

The user will be able to select a Distributed MP for a reboot.

3.2.10 INVENTORY REPORT

Appropriate changes will be done to the inventory Report to handle Distributed MPs

3.3 INFORMATION MODEL

3.3.1 DISTRIBUTED MP

An MP with "indirect-connection" will have the following additional attribute to define a Serial Number that will define it unique in the entire network. It will have all the common attributes and restrictions that can be had on a "direct-connect" MP.

3.3.1.1 DMP ID

DMP ID is the key of DMP. DMP is identified by an ID. The range of ID allowed for a DMP depends on MX type. The user will identify DMP configurations by this ID. Creation, modification or deletion of DMP configurations will be based on the DMP Port ID.

MX Type	DMP ID Range
MX-20	1..40
MX-6	1..8
MX-400	1..100

3.3.1.2 SERIAL NUMBER

Serial Number, a text field, has the following properties:

1. It is not mandatory to be entered to create the MP
2. It is required to be entered before deployment of configuration, if it is a "indirect-connect" in one of its port configurations

3.3.2 MOBILITY POINT

3.3.2.1 IP ADDRESS

This is an ip address on the Mobility Point and is not configurable. However, this information will be visible in property panel of the mobility point.

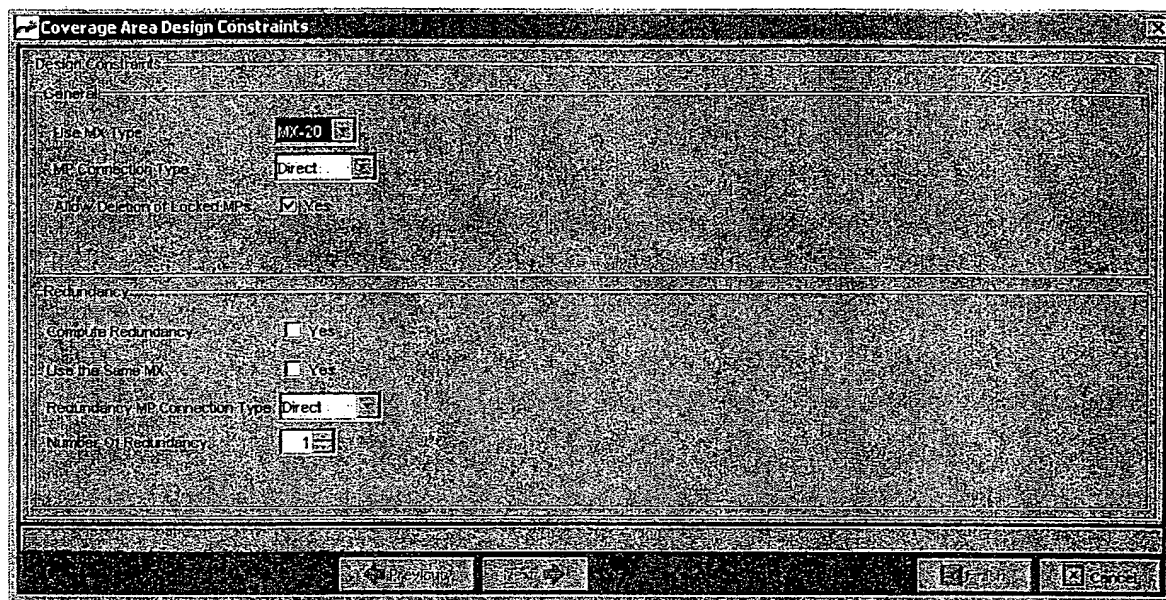
3.3.3 DESIGN CONSTRAINTS

The Design Constraints that can be applied on the entire floor or an individual Coverage Area. Changes to Floor Design Constraints, will be applied to any new Coverage Area that is created, unless the user applies them to a selective set of Coverage Areas.

Design Constraint	Description	Default	Comments
Use MX Type	MX-20, MX-6, MX-400 are the choices. This defines the type of MX that will be created by the planning tool	MX-20	
MP Connection Type	If any new MP is to be created, it will be created using user selection "direct-connection" or "indirect-connection" to first available port/DMPID in an MX	Choices are Direct and Distributed. Direct will be selected by default	If the MX type is MX-400, it will always be a distributed MP that will be created.
Compute Redundancy		Unchecked (no Redundancy)	
Use Same MX	If checked, the redundancy can be through the same MX from which the primary connection to MX was computed	No	
Redundancy MP Connection Type	When a redundancy is desired, this lets the planning tool know if the redundant connection to MP should be "direct-connect" or "indirect-connect"	Choices are Direct and Distributed. Direct will be selected by default	If the MX type is MX-400, it will always be a distributed MP that will be created.
Number of Redundant level	This is applicable only if Distributed MPs are desired for redundancy.	1	Test for 4 Max : 20
Allow Deletion of Locked MPs	Deletes the unwanted locked MPs upon compute and place	Yes	

3.3.4 COVERAGE AREA

The Coverage Area wizard will have an additional page to edit its design constraints. When the area is created, it gets its constraints settings from what is set on the floor.



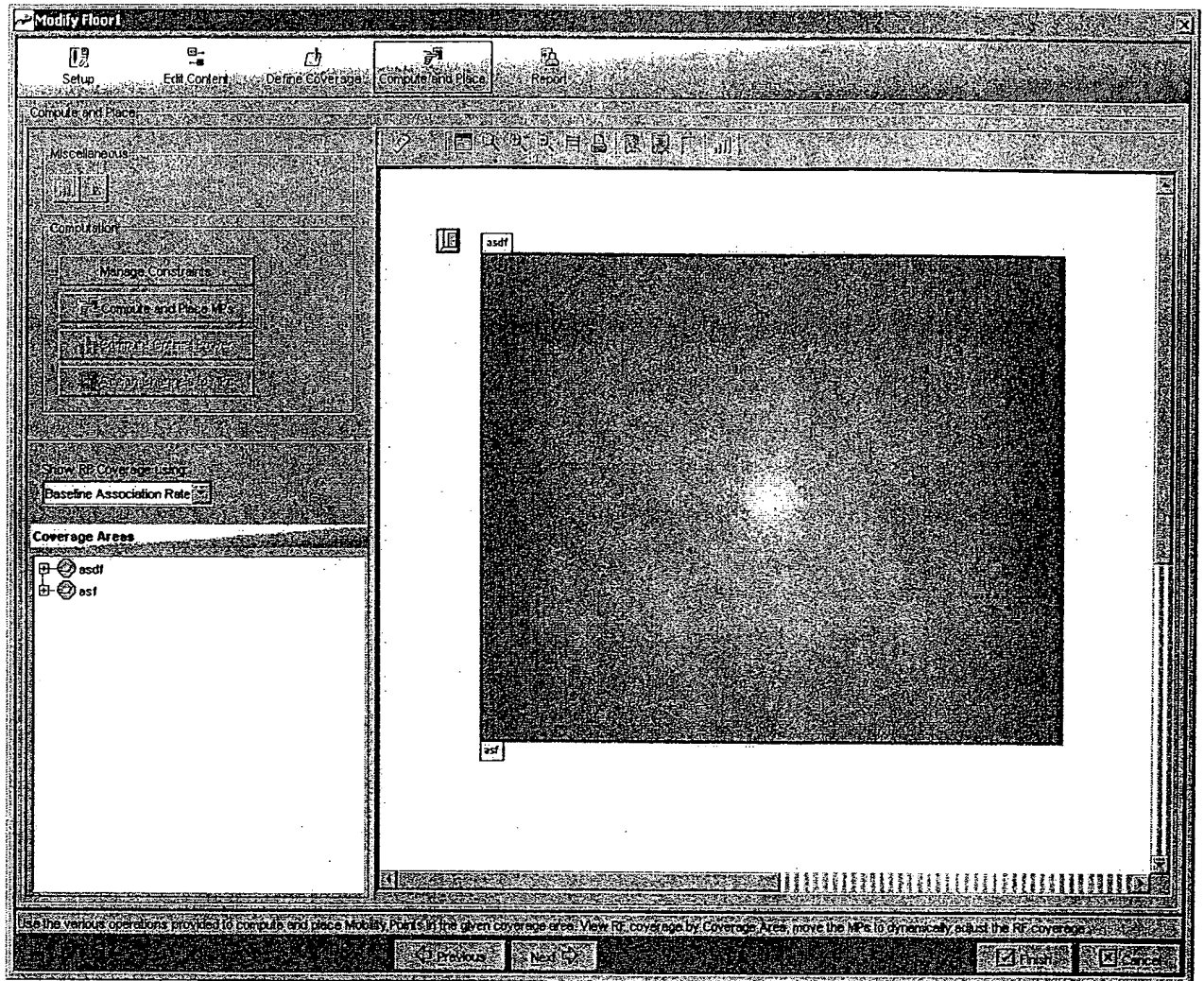
With the introduction of distributed MP support there are no changes to current coverage area properties like wiring closet, technology type ...etc.

3.4 ENHANCEMENTS TO RF PLANNING

This section will cover the impact on RF Planning. Some constraints will be defined for the user to make it clear for the planning tool to be able to create MP.

3.4.1 DESIGN CONSTRAINTS MANAGEMENT

A new action will be added to "Compute and Place" page to apply design constraints at a global level to coverage areas within a floor. Current design constraints page in Compute and Place MP wizard will be removed.



Clicking on Manage Constraints action will launch a wizard shown below where user can apply design constraints for all the coverage areas in a floor.

Select the constraints and the area(s) and clicking on next button will apply the constraints to selected areas and will show the progress. From the progress page user can click finish to commit the transaction or click cancel to cancel the changes. From the progress page user can click on previous button to come back and apply new constraints to different set of areas.

Manage Constraints

General

Use MX Type:

MP Connection Type:

Allow Deletion of Locked MPs: ☐ Yes

Redundancy

Compute Redundancy: ☒ Yes

Use The Same MX: ☒ Yes

Redundancy Connection Type:

Number of Redundancy:

Object Selection

Coverage Area	Select
Area_A	<input checked="" type="checkbox"/>
Area_B	<input checked="" type="checkbox"/>
Area_C	<input type="checkbox"/>
Area_D	<input checked="" type="checkbox"/>
Area_G	<input type="checkbox"/>

<< Prev Next >> Finish Cancel

Manage Constraints

Status

Applying design constraints to area: B

Completed applying constraints to area: B

Applying design constraints to area: C

Completed applying constraints to area: C

Completed applying constraints to all the selected areas.

<< Prev Next >> Finish Cancel

3.4.2 MP COMPUTATION

During computation of MP for the area, design constraints set for that coverage area is used to create distributed MP or direct-connected MP.

In case of shared areas changing design constraints of one area changes design constraints of the shared area.

Note: If User selects distributed MP for initial connection type / redundancy then RingMaster will select MX from the primary/redundant closet with the least DAP connections. If MXs are not available in the primary/redundant closet or if redundant closet is not provided then RingMaster will use MX in the mobility domain with least DAP connection.

3.4.3 WORKORDER

- New column will be added in MP table to display serial number of the distributed MP.
- Wiring closet distance table will not be generated for a distributed MP.
- For distributed MP we will display “LAN/WAN” text in MX Port column of all the tables.
- All the above changes need to be updated in both English and German version.

Mobility Points (MP)

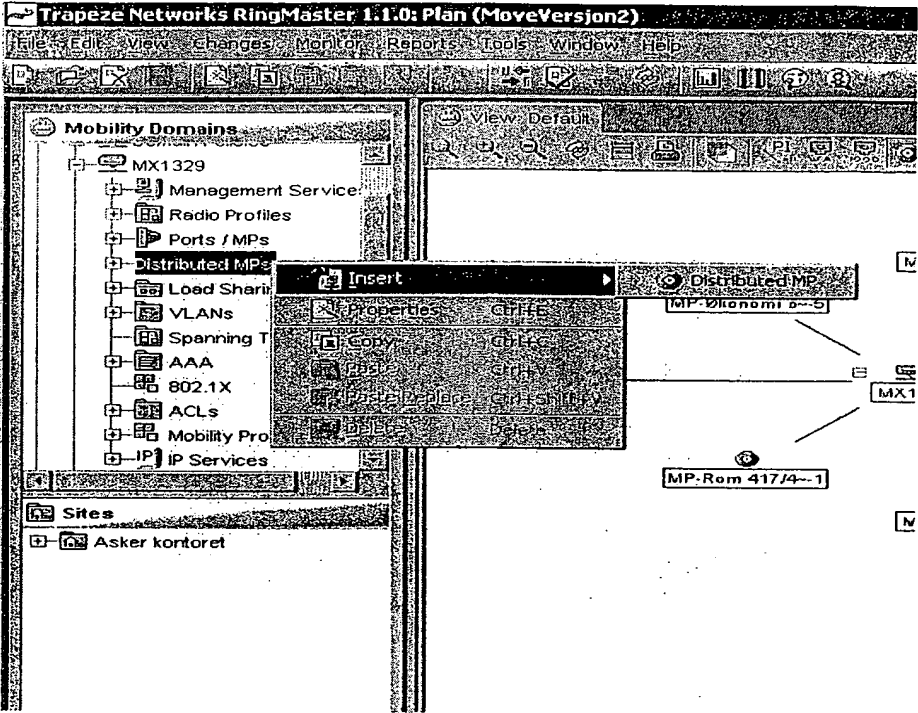
MP sorted by distance from the top-left corner of the floor plan.

Index	MP Name	Model	MX Port (Name:Port)	MX Port (Name:Port)	Serial Number	Coverage Area (802.11a)	Coverage Area (802.11b/g)
1	MP-asf-23	MP-252	mx-104:P09	mX4394:P09		asf	asdf
2	MP-asf-25	MP-252	LAN/WAN	LAN/WAN		asf	
3	MP-asf-36	MP-252	LAN/WAN			asf	
4	MP-asf-38	MP-252	LAN/WAN			asf	
5	MP-asf-23	MP-252	mx-104:P15			asf	

3.5 OTHER ENHANCEMENTS

3.5.1 TREE VIEW

In the Devices Tree View, DMPs will appear in a separate folder under the Device. This is to visually show existence of certain DMP configurations on the MX. It will appear as follows:



3.5.2 CREATE DMP WIZARD

Unlike “direct-connect” MP, DMPs will have a create wizard to insert a DMP in an MX. It will allow the user to create the DMP in its basic form. To add/remove redundancy, the user will have to edit that DMP. Since RingMaster allows manual configuration of MPs, this create wizard will enable the user to create a DMP. However, it is always recommended to the user to use RF Planning tool to create the necessary MPs for their deployment.

The screenshot shows a window titled "Create Distributed MP" with a "MP Setup" tab selected. The window contains the following fields and controls:

- DMP Number:** A text box containing the value "1".
- Serial:** An empty text box.
- Name:** An empty text box.
- MP Model:** A dropdown menu showing "MP-122".
- MP Radio Type:** A dropdown menu showing "11b".
- Bias:** A dropdown menu showing "High".
- Enable Blink:** A dropdown menu showing "No".
- Enable Firmware Update:** A dropdown menu showing "Yes".

At the bottom of the window, there are four buttons: "Back" (disabled), "Next" (with a right arrow), "Finish" (checked), and "Cancel".

3.5.3 EDIT MP WIZARD

In the current MP wizard, the GUI is restricted to a maximum of 2 port configs. With the introduction of DMP configurations, an MP can have more than 2 port configs, if the port type is DMP port.

The UI will be modified as follows to allow the user to add, modify, and delete one or more Connection information of the MP

The screenshot displays the 'Edit MP Wizard' GUI. At the top is a title bar with the text 'Enter Title Here'. Below this is a 'General' section containing the following fields and controls:

- MP Model:** A dropdown menu currently showing 'MP-122'.
- MP Radio Type:** A dropdown menu currently showing 'None'.
- Name:** An empty text input field.
- Enable Blink:** A checkbox that is currently checked, with the label 'Yes'.
- Enable Firmware Update:** A checkbox that is currently checked, with the label 'Yes'.

Below the 'General' section is a 'Connection Information' section. It features a list box on the left containing the following entries:

MX1:P01	(Bias:High)
MX1:DMP1	(Bias:Low)
MX2:DMP2	(Bias:Low)
MX3:DMP8	(Bias:Low)

To the right of the list box are three buttons: 'Add', 'Modify', and 'Delete'. At the bottom of the window are four navigation buttons: '< Prev', 'Next >', 'Finish', and 'Cancel'.

The user will be able to "ADD" two types of connections:

- Direct-connect (Local)
- Distributed

The user will be able to “Modify” any connection information. The user can use this feature to move the connection information within the same type of connection. For example, if the user edits a “direct-connect” connection information, the user will be able to move within any available MX ports.

When the user attempts to create/modify direct-connect connection information, following UI will be shown:

The dialog box is titled "MP Connection Information". It contains the following fields and controls:

- MX:** A dropdown menu with "MX1" selected.
- Port:** A dropdown menu with "P01" selected.
- Bias:** A dropdown menu with "High" selected.
- Sticky bit Enabled:** A checkbox that is checked, with "Yes" displayed next to it.
- Port Enabled:** A checkbox that is checked, with "Yes" displayed next to it.
- Load Balance Group:** An empty text input field.

At the bottom of the dialog are four buttons: "<< Prev", "Next >>", "Finish", and "Cancel".

When the user attempts to create/modify distributed connection information, following UI will be shown:

The dialog box is titled "MP Connection Information". It contains the following fields and controls:

- MX:** A dropdown menu with "MX1" selected.
- Distributed MP ID:** A numeric input field with "1" entered.
- Serial Number:** An empty text input field.
- Bias:** A dropdown menu with "High" selected.
- Sticky bit Enabled:** A checkbox that is checked, with "Yes" displayed next to it.
- Load Balance Group:** An empty text input field.

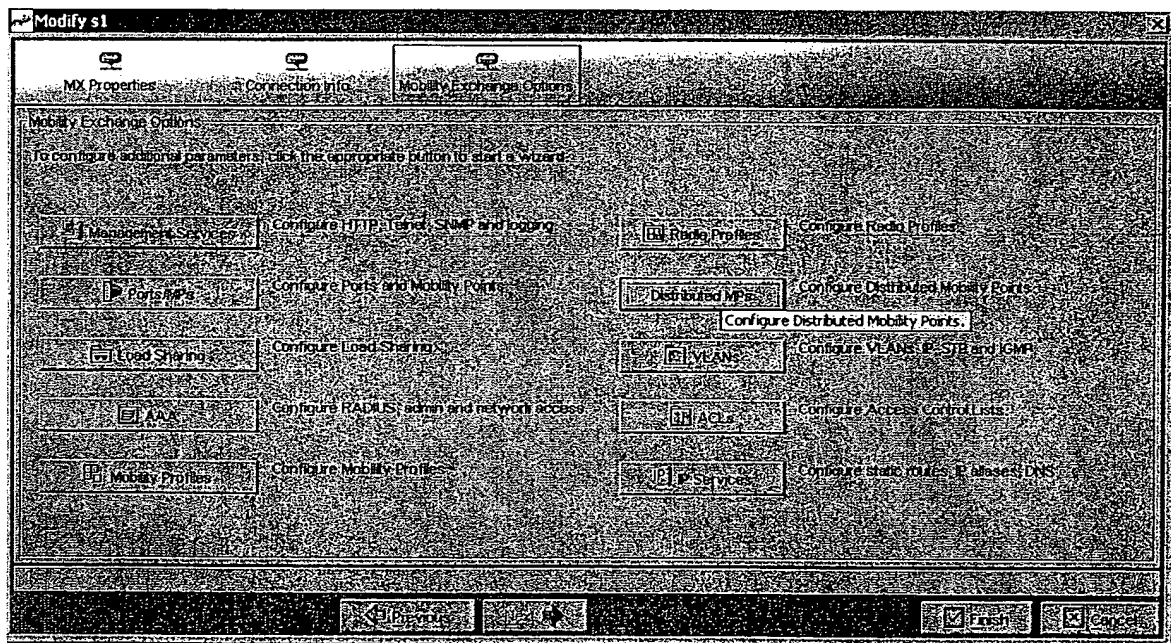
At the bottom of the dialog are four buttons: "<< Prev", "Next >>", "Finish", and "Cancel".

In addition to the above functionality, the WIZARD will restrict the following:

1. An MP cannot have more two “direct-connect” connections.
2. If an MP has 2 “direct-connect” connections, it cannot have any “distributed” connections.
3. An MP can have only one “indirect-connect” connection per MX.
4. Any serial number modified here, will be applied to all “Distributed” connection information.
5. At least one connection information must be present in order to finish this wizard. The Delete action will be disabled if only one connection is remaining.

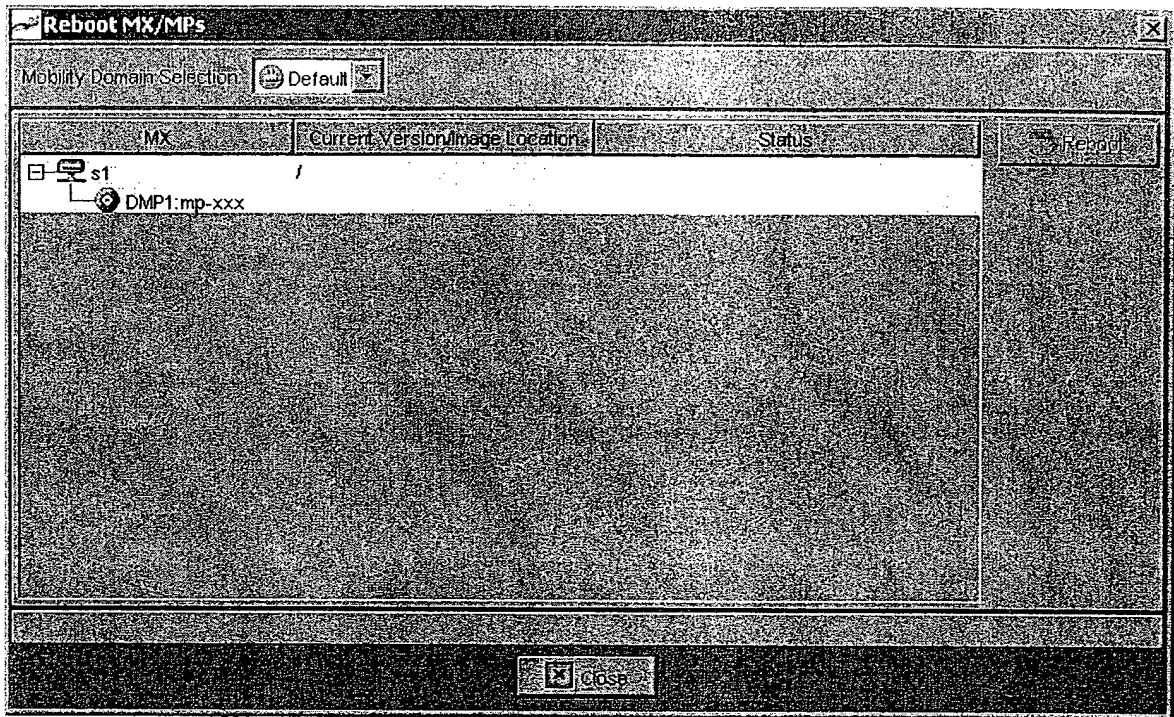
3.5.4 CHASSIS WIZARD

The user will be provided another action button to launch creation of Distributed MPs as shown in the following picture:



3.5.5 REBOOT DIALOG

The user will be able to select Distributed MPs for reboot as shown in the following picture:



The user will be able to view the status of the reboot of a Distributed MP.

3.5.6 INVENTORY REPORT

Mobility Point Table will also include any "indirect-connections" to a Mobility Point.

The count of MP shown per MX will also consider DMP configurations within the MX

MX(s)	MP Name	Model	Serial Number	Bootloader Version	Radio 1 Type	Radio 2 Type	Radio 1 MAC Address	Radio 2 MAC Address
mx-104:P04 mx-104:P06 mx-104:DAP1	MP04	MP-122	0321700018	QA_1.0.0.175_	B	A		
mx-104:P08	MP08	MP-252	0321500047	QA_1.1.0.67_	G	A	00:0e:0b:00:04:d3	00:0e:0b:00:04:d4

3.6 FAULT MANAGEMENT

The User will be able to see the status of Distributed MPs in RingMaster. The status of MP will be a cumulative status of all its redundant configurations.

In addition to the radio status, the user will be able to see the IP address of the MP that it got assigned during its boot process. This will be visible in the Property panel of the MP. If the MP is running an image version less than 2.0, this field will have no value.

3.7 IMPACT ON RF DETECTION

There will be changes in RF Detection configuration page when user selects MPs to exclude all direct-connect and distributed MP will be shown.

In RF detection results page when user selects known or missing devices both direct-connect and distributed MP are considered.

3.8 NETWORK TOPOLOGY VERIFICATION

Network Topology Verification provides useful information to the user and can be used for the following purposes:

- Find out information about unconfigured MPs in the network
- Find out information about mis-configured MPs in the network
- Find out information about configured MPs that are not reporting any status
- Find out information about MPs that are physically multi-homed but not so in the configuration
- Find out information about an MP that has booted off an MX that had a lower Bias setting in its configuration

This information can be used by the user to update/correct the configurations in the network Plan. Currently, the user has to do it manually. RingMaster will now provide easy actions in the network topology window to correct certain kinds of information. They are:

- Ability to update Redundancy information of MP
- Ability to update Serial Number of MP

3.8.1 VERIFY UNCONFIGURED MPS

An MP can be connected to the network either with “direct” or “indirect” connections, even before it is configured in the network plan and available on any one MX in the mobility domain. This rule will catch such “orphans” and notify the user.

3.8.1.1 *DIRECT-CONNECT MP*

When an MP is directly connected to MX, it is expected to have a MP configuration record at that particular port. Failure to find that record on that port where MP is requesting configuration from, will flag this MP as an "orphan". RingMaster will continue to use the existing AP-ANNOUNCE-STATUS to deduce this information.

3.8.1.2 *DISTRIBUTED MP*

When an MP is totally distributed, it is considered an "orphan" by the MX that received the configuration request, if that MX did not find any other MX in the domain to contain its configuration. It is possible that this record can move from one MX to another, if another MX is chosen by MP to request for its configuration. RingMaster will use the new DAP-ANNOUNCE-STATUS record to obtain this information

Note: MX cluster must ensure that there is only one orphan record for a given serial number in any of its membership.

Action Item: (NOS team) to verify the above note

3.8.1.3 *MP WITH ONE DIRECT-CONNECTION AND ONE INDIRECT-CONNECTION*

For An MP that is "mixed" in connections, that is one direct and other indirect; RingMaster will use either AP-ANNOUNCE-STATUS or DAP-ANNOUNCE-STATUS to show the "orphan". Either or both records will have information about the "orphan".

3.8.2 *VERIFY CONFIGURED MPS NOT REPORTING STATUS*

This rule will catch "configured APs not reporting status" and notify the user.

3.8.2.1 *DIRECT-CONNECT MP*

When an MP is directly connected to MX, it is expected to have a MP configuration record at that particular port. Failure to find AP-ANNOUNCE-STATUS record on that port, will flag this MP as an "configured AP not reporting status".

3.8.2.2 *DISTRIBUTED MP*

When an MP is totally distributed, it is considered a "Configured MP not reporting status" when there is no DAP-ANNOUNCE-STATUS record found for that serial number.

3.8.2.3 *MP WITH ONE DIRECT-CONNECTION AND ONE INDIRECT-CONNECTION*

Failure to find any AP-ANNOUNCE-STATUS record for the direct-connection and DAP-ANNOUNCE-STATUS record for that serial number will indicate that this "configured AP is not reporting status".

3.8.3 VERIFY MIS-CONFIGURED MPS

This rule will catch “MP model mismatch” and notify the user. It will use the “model” information provided in AP-ANNOUNCE-STATUS or DAP-ANNOUNCE-STATUS.

3.8.4 VERIFY REDUNDANCY CONFIGURATIONS

This rule will catch one of the following errors:

1. MP is directly connected to two MX ports, however, in configuration, they are not redundant
2. MP is directly connected to two MX ports, however, in configuration, the MP is redundant with different port
3. MP is connected to one MX using “direct-connection”, and other MX using “indirect-connection”, and the MP is not redundant in the configuration

3.8.5 VERIFY SERIAL NUMBER CONFIGURATION

This rule will check for serial number configuration of an MP that has a “mixed” set of connections. Typically, if MP is totally distributed and the serial number is incorrect, it will be discovered as an “orphan”. However, if it has one direct-connection, there is a possibility that the MP boots off that MX port and it may have a different serial number in its configuration

It will be a serial number mis-configuration, if:

MP is configured to one MX using “direct-connection” and other MX using “indirect-connection” and configured with Serial Number “X”, but MP with Serial Number “Y” is connected to the above configuration. (MP is not an orphan but has a serial number mis-configuration)

3.9 VERIFICATION RULES

Following rules will be implemented:

1. Configuration of Indirect-connection on an MP is not supported in MX version below 2.0
2. Warn the user when coverage area is associated to a remote wiring closet when you have direct connected MPs in the coverage area
3. Generate an error if user tries to deploy a distributed MP without a serial number.
4. Generate an error if there is more than allowed MP (direct-connected + distributed) for a given MX type.
5. Generate an error if both main and redundant MX is the same for a distributed MP.
6. Warn the user if distributed MP has more than allowed redundant connections.
7. Warn the user if distributed MP is created on older version of the box that does not support distributed MP.

3.10 CLI MAPPING/DTD CHANGES

There will be a need to correct the CLI mappings for some commands that will have additional attributes or values.

3.10.1 CLI COMMANDS

Configuration of Distributed MPs will have a separate set of CLI commands. Actual CLI Commands will be provided by Product Management.

Creation of DAP:

Set dap <dap number> serial-number <sno> model <model> type <type>

Modification of DAP:

All current AP commands will apply to "DAP" with the replacement of keyword "ap" by "dap". As an example,

Set ap 1 radio 1 channel 64 (for AP connected on port 1)

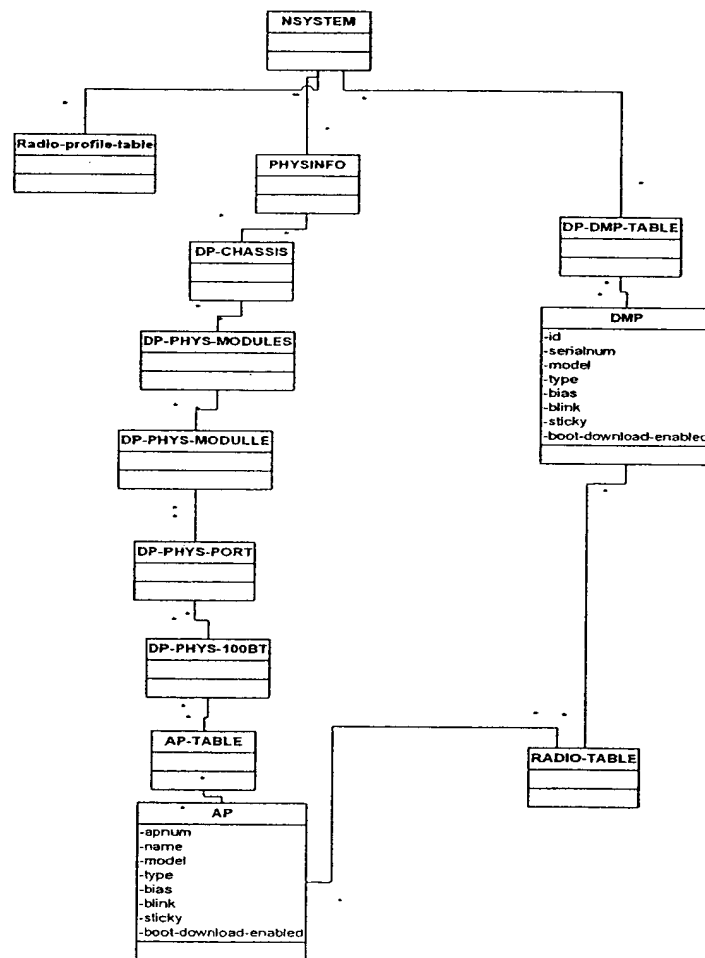
Set dap 1 radio 1 channel 64 (for dap configured on MX on dap number 1)

In addition to modify serial number of a dap, the CLI command

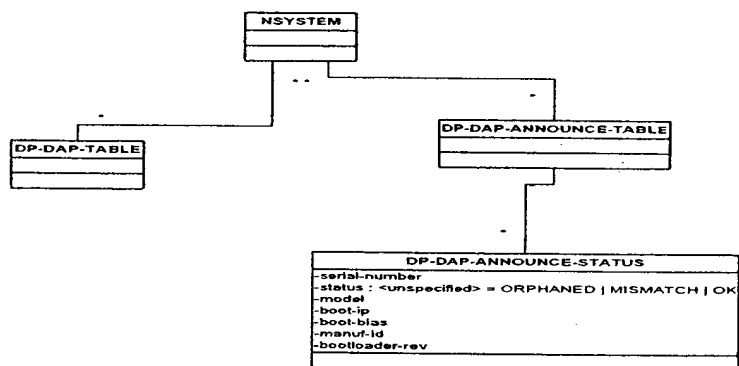
Set dap 1 serial-number <new sno> will be supported.

3.10.2 DTD MODEL CHANGES

For Configuration, following instance model will be used to distinguish between direct-connect AP and Distributed AP.



3.10.3 DTD CHANGES FOR ANNOUNCE STATUS



A DAP has a status of “orphaned”, if there is no config record for that serial number

A DAP has a status of “mismatch”, if the model does not match but sno matches.

A DAP has a status of “OK”, if the MP has booted off this MX and therefore, will have non-null values in boot-ip and boot-bias

3.11 STATISTICS

The Statistics module will be enhanced to be able to handle Distributed MPs

3.12 IMPACT OF MX VERSIONING

Certain CLI commands or attribute value pairs will not be available for certain versions of MX software. This will impact various planning operations.

4 POLICY MANAGEMENT

4.1 CURRENT DESIGN & ISSUES

In 1.x RingMaster the Mobility Domain Policy object is effectively an MX-20 device. This means that as new devices are created from scratch, the system would automatically clone the MX-20 policy as the basis for a new device.

4.1.1 SUPPORT FOR MULTIPLE DEVICE TYPES & VERSIONS

As we introduce more device types into the supported device set in RingMaster the current scheme does not work. The policy system also does not take into account software revisions.

4.1.2 POLICY CRITERIA

In 1.x RingMaster only allows a single policy per mobility domain. This is not flexible, as the user may want to pick and choose devices across mobility domains, or a subset of devices within a mobility domain, to be policy controlled.

For example, a user may want to define a AAA policy that spans all devices regardless of mobility domain membership.

Also, moving forward a user may want to define a policy that is limited to certain device types or software versions.

4.1.3 CHOOSING WHAT TO APPLY

Currently the entire policy is always applied to the device to produce a diff-set that is shown as CLI commands. Then the user can select individual CLI commands to Apply to the device.

This can be dangerous also gets annoying to see unrelated changes each time the policy is applied and to have to deselect commands that are not needed. For example if the user wants to only use the policy for AAA data, they have to always deselect clearing of unrelated data like MOTD, default routes, or have to update the policy to contain that data.

4.2 PROPOSED CHANGES

- 1) The policy object no longer exists per mobility domain. We define a new policy database per plan. The database starts out empty, and the user can add/delete policies to the database at any point.
- 2) Policies contain set of criteria which determines whether they should be selected for a device. Initially the scope can be the device type and software version.
- 3) When a device is created or uploaded, policies with the criteria that matches the device will be selected for it. The user can fine tune this or accept all matching policies. For created devices, data from all selected policies will be applied; for uploaded devices, an association will be formed but the data will not be applied till the policy manager is invoked.
- 4) Devices and policies can be associated or disassociated at any point. The user can select a device and modify its policy associations. The user can also delete/add policies, or modify its criteria.

- 5) When a policy is created one or more of the following functional areas can be chosen. A functional area is any sub-tree of data in the containment hierarchy. Here is a starting list:
- a. Management services
 - b. VLANs
 - c. STP Properties
 - d. ACLs
 - e. IP Services
 - f. Radio Profiles
 - g. Load Sharing
 - h. AAA
 - i. Radius
 - ii. Local User Database
 - iii. Admin Access Rules
 - iv. Network Access Rules
 - i. Mobility Profiles

6) The user is free to select multiple policies, even with data that may conflict. This implies that there is an ordering of policies that has to be exposed to the user, as if the same data fields exist in multiple policies, depending on the order of application the results will be different.

7) The policy manager function will allow the selection of one or more policies to be applied. The resulting changes will be shown as CLI commands. The user will have the option of deselecting the entire batch of CLI commands for a particular policy, but will not be able to select individual CLI commands like is done today.

- 8) The Device -> Policy merge will be deprecated. Instead the user will be given a command/action to simply converting device data into policies. For example the user can select a VLAN in a device and select a menu option "Make Policy". This will launch a wizard that allows the user to create a new policy with that data, or conceivably Apply that data to an existing policy. Underneath this is the same as doing a "cut & paste" operation from a device to a policy.

4.3 QUESTIONS & ISSUES

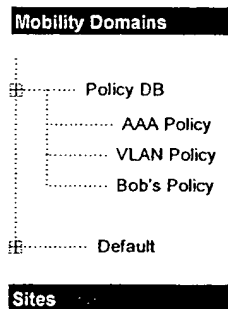
- The design and level of support for versioning will impact this and other features. Some of the questions that come up are:
 - If the user does not select any device version restriction the UI will operate in the latest version. How does this work for device types. For example the VLAN wizard for an MX-6

device will show a different number of available ports than a VLAN wizard for a MX-20. When we configure a VLAN in the policy, the type has to be known to show the available ports. Same for mobility profiles, and other objects that depend on the physical aspects of the device.

- If a policy is applied to a device that is off the wrong type, the user should be somehow shown a failure. For example, if we create a VLAN policy and add 20 VLAN members to it and Apply it to an MX-6 device, this should be flagged as an error.
- Can we somehow show a status of pending policy changes?
- The policy manager can have a drop-down list of policies and show affected devices. But this may be tedious so how can we intuitively allow the user to select multiple policies at once? We could show the changes as demarked groups that can be selected or unselected.
- Performance improvements?

4.4 CREATE POLICY

1. When a new plan is created, it contains an empty Policy DB. The user can add or delete policies to the policy database.



2. The Create Policy wizard consists of 3 steps:

- a. Policy Setup: here the user can name the policy and define its criteria.
- b. Device Selection: all devices that match the defined criteria are eligible to be selected. By default none are, and the user can add in the appropriate devices.
- c. Policy Data Setup: the user can select what data is to be in the policy and also launch nested wizards to configure that data.

Create Policy Wizard

Policy Setup Policy Member Selection Policy Data Setup

Policy Setup

Policy Name:

Policy Criteria

Applicable Versions:
1.0
1.1

Applicable MX Type:
MX-6
MX-20

Create Policy Wizard

Policy Setup Policy Member Selection Policy Data Setup

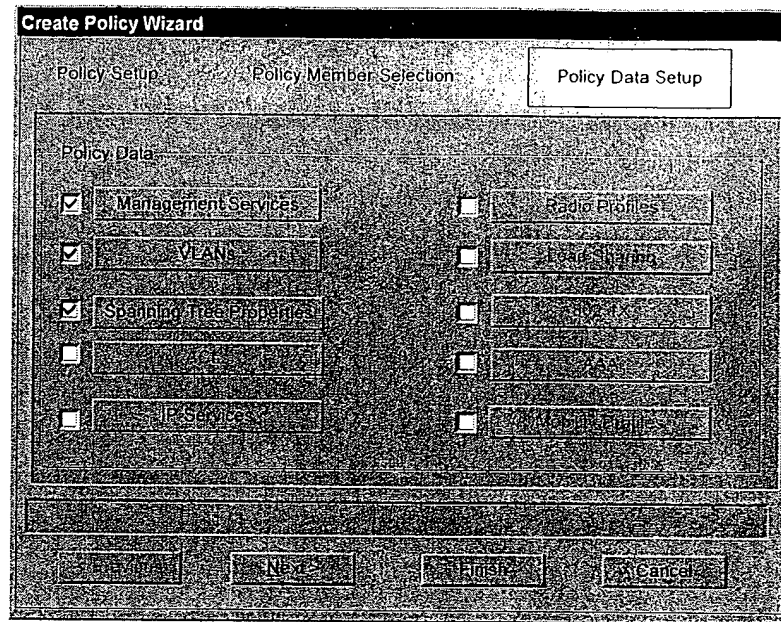
Policy Member Selection

Current Members

Default: MX1
Default: MX2

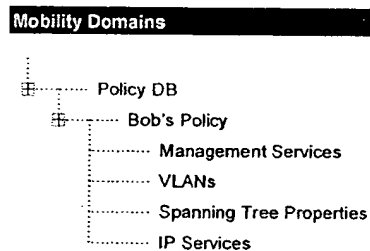
Available Members

Default: MX72
Default: MX73
Modo1: MX100



4.5 MODIFY POLICY

1. The user can select a policy in the organizer panel and launch a modify wizard for it. This will have the same flow as the Create Wizard. The user can also select a previously enabled configuration area under the policy and directly launch a modify wizard for that area.



2. The user can edit the policy name and/or criteria. However, if the policy has associated devices that will not match the updated criteria the user will be prompted to de-associate those devices first.

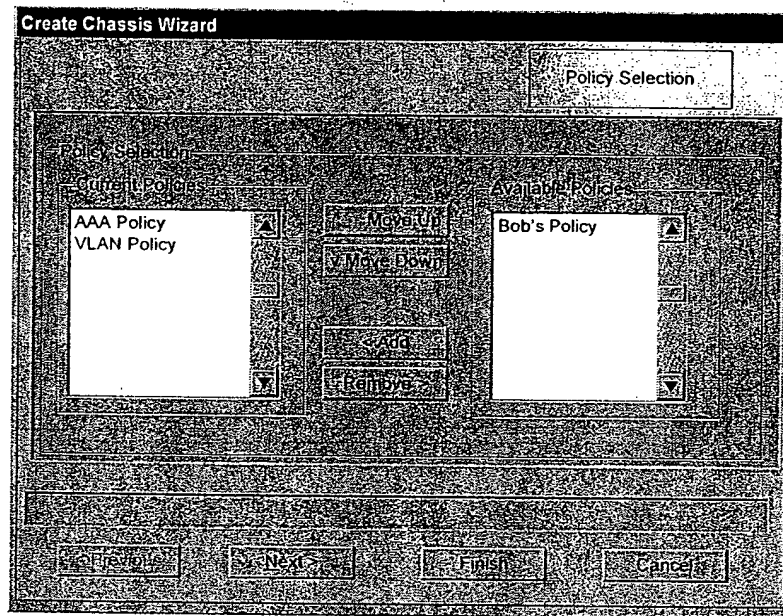
4.6 DELETE POLICIES

Policies can be deleted, like any other model object.

4.7 ASSOCIATE DEVICES & POLICIES

When creating a Policy it can be associated to devices. Also while creating, uploading, and/or modifying a device the user can fine-tune the policy assignments for that device.

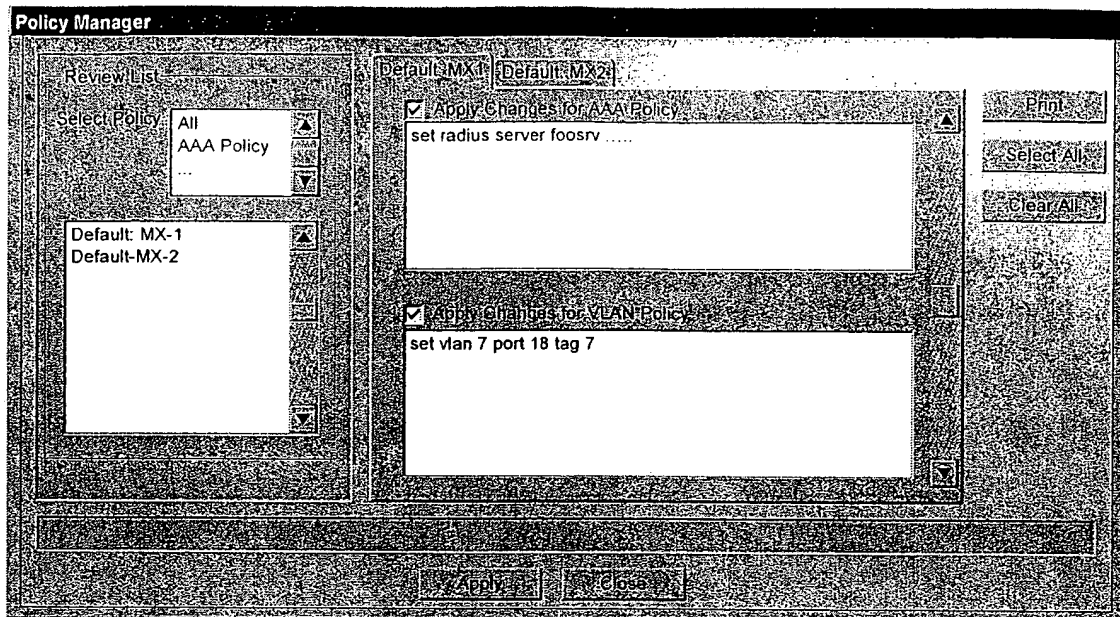
A “Policy Selection” page will be available in the Create/Modify/Upload device wizards. In this page the user can add or delete policy associations for the device. The user can also order the policies for the device. The ordering is only important if multiple policies have overlapping data.



4.8 APPLY POLICIES

Policies are applied to devices using the Policy Manager.

1. User selects a single policy or all policies to be applied.
2. The list of devices with pending changes for the selected policies is calculated and displayed.
3. The user can click on an individual device and see what the result of Applying the policy is as CLI commands.
4. The user can un-select a particular set of changes (grouped by the applied policy.)
5. The user then clicks Apply. The list of changed devices is re-calculated and displayed.



4.9 CREATE POLICIES FROM DEVICE DATA

A user may want to make a device's configuration data into a policy. This can be done by creating a policy and then doing a copy-n-paste of the data. It would be nice to provide a one step operation to do that.

1. User selects a device configuration element. If this is a configuration element that is policy enabled (i.e. not a port/MP, etc.) and is a policy sub-tree the user can select a menu option to make a policy out of the data.
2. A wizard will prompt the user to as if they want a new policy, or to add the data to an existing policy. The wizard will guide the user through the remaining steps to setup the policy (similar to create/modify policy.)

4.10 READING OLD PLANS – BACKWARD COMPATIBILITY

The release which implements this feature will need to support the reading & conversion of network plans that have the old policy hierarchy.

The conversion will be done as follows:

1. For each mobility domain in the old plan, a policy will be created in the new plan, under the policy database, with the name: "<Modo Name> Policy".
2. The new policy will have associations with all members of the mobility domain in was created from.

This conversion will most likely be implemented in an XSLT stylesheet and will be plugged in to the overall version conversion framework (see section on Versioning.)

4.11 IMPROVE PERFORMANCE

There have been complaints on the performance of (or lack thereof) the Policy dialog, and the underlying CLI mappings. Here are some things that can be done:

1. Profile to/from CLI code to identify any bottlenecks.
2. Scrub all CLI mappings to optimize how XPATH is used.
3. Allow to-CLI output to be streamed rather than wait for all commands to be generated.
4. See if XML->CS->CLI->XML->MODEL algorithm for the policy manager can be simplified. We can still use the CLI as a display but can internally Apply the XML which would avoid a CLI->XML conversion.

4.12 DELIVERABLES & ESITMATES

Here are some rough estimates (development & test) for the deliverables:

1. Model changes - Create/modify/delete policies: 4 days
2. Associate devices & policies: 2 days
3. Apply policies: 4 days
4. Multiple version & device type support: 4 days
5. Reading old plans - backward compatibility: 3 days (2 days for f/w + 1 day for policy)
6. Create policies from device data: 2 days
7. Performance Improvement: 2 days

4.13 NOTES ON IMPLEMENTATION

1) There are various ways we could implement the policy rules. One way would be to actual create a new policy class that contains the criteria part:

- a list (would be individual Booleans actually) of device types (out of the descriptor map)
- a list (again would be individual Booleans) of software revisions.

The action/data part would be stored as an XML fragment of configuration. This means that the XML fragment(s) would not be completely parented (i.e. belonging to a device). For the AAA example, the root object would be the AAA class and would be owned by the policy object itself. Maybe a one-one tightly coupled relation would work so that if we were to delete the policy rule it would delete the configuration fragment. There would also be various other modifications to the system to allow such objects to be edited reusing the same pages/wizards without requiring a complete device hierarchy to support the configuration element.

2) In 1.0 each object or device that is controlled by a policy has a pointer to the policy object. We would have to make sure that after pushing a policy to a device that the particular object itself is tied to the policy rather than assuming the whole device is controlled by a single domain policy.

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